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Benthic Polychaetes from Puget Sound, Washington, with Remarks on Four Other Species[1]

By Karl Banse and Katharine D. Hobson[2]

We describe here eight new polychaete species, give 25 new records, and discuss 35 other forms. Forty-one species (including one unnamed species discussed below, and three new species and four new records to be published by K. Banse and F. H. Nichols in other papers) are added to 394 benthic polychaetes previously known from waters of Washington and British Columbia. The new records probably reflect incomplete knowledge of the region rather than recent immigration into the area. There is no trend toward predominantly arctic or warm water additions, as one would expect with new immigration resulting from climatic changes. Incomplete knowledge of the polychaete fauna of this area is suggested further by the fact that the 41 additions mentioned above were among 162 named polychaete species in our collection. For comparison, there is no new record among 49 named bivalve species of the same collection (Mr. D. Kisker, pers. comm.).

Polychaetes were identified from 116 samples taken in 1963 at eight subtidal stations in Puget Sound by the Department of Oceanography, University of Washington, under the direction of U. Lie

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and K. Banse. Samples were collected with a 0.1-m² van Veen grab and washed through a screen with square meshes of 1 mm side length. The formalin-preserved animals were separated from the residue in the laboratory under slight magnification. The nomenclature follows Hartman (1959, 1965b) except as noted otherwise. A reference to other descriptions is omitted if the species is included in Berkeley and Berkeley (1948, 1952). All colors refer to formalin-preserved material. Drawings illustrating new species are made from holotypes if not stated otherwise. Station numbers are given only for new species and new records. A list of all species in our collection with specimen numbers per station and dates of sampling is contained in Lie (in press). A set of identified species is deposited in the U.S. National Museum.

The station characteristics are given below (from Lie, in press). The mean depth is calculated from seven quarterly visits (this is given on the labels of the material in the U.S. National Museum). The depth range, however, refers to the recordings of those visits when polychaetes were identified. Quarterly samples were studied for stations 2 and 7, whereas for the other stations polychaetes were identified only from winter and spring collections. Sediment was subsampled for particle size analysis from about one-third of the grab samples from the winter and spring collections. The average results are presented below ("clay" refers to particles smaller than 0.0031 mm, "silt" to particles between 0.0031 and 0.0625 mm in diameter, and "gravel" to particles larger than 2.0 mm).

Station 1 (47°41′33″ N, 122°24′18″ W). Mean depth 23 m, range 15–24 m. Mean particle size 0.139 mm (fine sand). Clay 3.0%, silt 11.1%, sand 84.2%, gravel 1.7%.

Station 2 (47°42′16″ N, 122°26′24″ W). Mean depth 196 m, range 172–210 m. Mean particle size 0.0067 mm (silt). Clay 34.0%, silt 59.3%, sand 6.8%.

Station 3 (47°44′31″ N, 122°31′53″ W). Mean depth 22 m, range 17–22 m. Mean particle size 0.126 mm (fine sand). Clay 4.7%, silt 11.3%, sand 83.9%.

Station 4 (47°44′31″ N, 122°32′41″ W). Mean depth 12 m, range 10–18 m. Mean particle size 0.104 mm (very fine sand). Clay 3.0%, silt 18.8%, sand 77.9%, gravel 0.4%.

Station 5 (47°10′48″ N, 122°50′00″ W). Mean depth 22 m, range 17–37 m. Mean particle size 0.43 (medium sand). Clay 4.5%, silt 5.5%, sand 82.8%, gravel 7.2%.

Station 6 (47°10′40″ N, 122°48′48″ W). Mean depth 35 m, range 30–40 m. Mean particle size 0.22 mm (fine sand). Clay 5.9%, silt 20.5%, sand 66.2%, gravel 7.5%.

Station 7 (47°13′30″ N, 122°49′36″ W). Mean depth 68 m, range 47–84 m. Mean particle size 0.009 mm (silt). Clay 26.7%, silt 59.3%, sand 13.8%, gravel 0.2%.

Station 8 (47°07′24″ N, 122°50′06″ W). Mean depth 15 m, range 9–21 m. Mean particle size 0.37 mm (medium sand). Clay 3.6%, silt 7.3%, sand 79.4%, gravel 9.7%.

The annual temperature range of the shallow stations during 1964 was 8–13° C, that of station 7 was 8–12° C, and that of the deepest station (2) was 8–10.5° C. The average salinity for stations 1–4, off Seattle, was 29.8‰; that for stations 5–8 in the southern Sound (Case Inlet) was 29.2, with very little variation. At station 8, the shallowest of the eight stations, the seasonal range was 28.0 to 29.7‰ S, and at station 2, the deepest one, it was 29.4 to 30.8‰ S. The oxygen concentrations were between 58% and 87% of saturation. The data of 1964 were representative for other years (Lie, in press). Water movement near the sea bed was always noticeable at the stations during studies with a television camera.

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Family Polynoidae

Eunoe uniseriata, new species

Figure 1

Eunoe sp. I Banse et al. [in press].

Types.—Holotype: USNM 36273, from Station 2, 47°42′16″ N, 122°26′24″ W (November 1963). Paratype: USNM 36274 (1, in fragments) from Station 7, 47°13′30″ N, 122°49′36″ W (February 1963).

There are eight anterior and some posterior fragments from stations 2 and 7. The holotype has 18 setigers and is 12 mm long without cirri. It is 7 mm wide without cirri or setae and 2.5 mm without parapodia. The width of a mature female (paratype, 32 setigers) is 8 and 3 mm, respectively.

Description.—The prostomium (fig. 1*a*), slightly broader than long, is divided by a mid-dorsal furrow, is blunt anteriorly and without peaks. There are two pairs of eyes, which, after two years of preservation, have disappeared in some specimens. The appendages of the prostomium bear scattered short filiform papillae. The antennae arise from large cirrophores. The median antenna of the paratype is as long as the tentacular cirri. The lateral antennae insert terminoventrally. The styles are disproportionately thin and short compared with the cirrophores. The palps are about 4.5 mm long. There are two smooth spines in the base of each dorsal tentacular cirrus.

The dorsal and ventral surfaces of the body are smooth save for the distinct segmental borders. The first segment with elytra forms a low collar behind the prostomium. Its ventral cirri are elongated, almost approaching the tentacular cirri in length. Median parapodia (fig. 1*b*) have long dorsal cirri with numerous long papillae. Neuropodia

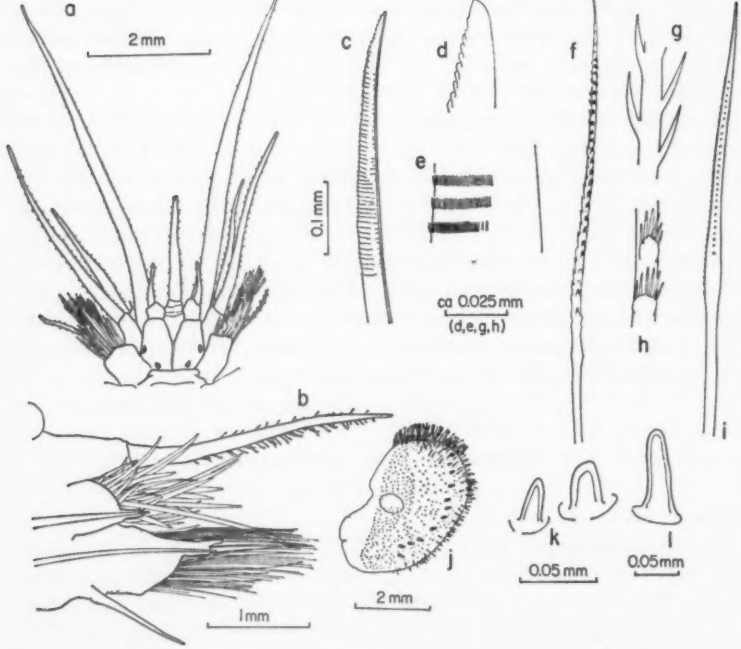

FIGURE 1.—*Eunoe uniseriata*, new species: *a*, dorsal view of anterior end, without elytra; *b*, anterior view of seventh parapodium; *c–e*, notoseta, with detailed views of tip and middle section; *f–h*, upper neuroseta, with details of scales (*g*, optical section); *i*, lower neuroseta; *j–l*, elytron, microtubercles, and macrotubercle.

are longer than the notopodia and terminate in finger-like extensions above the aciculae. The ventral cirri are smooth. The presence of elytrophores on a tail end (paratype) indicates that the elytra cover most of the body.

All setae have entire tips. Notosetae are stouter than neurosetae; they are yellowish and finely serrated almost to the pointed tip; the distal rows of spines are irregularly spaced (figs. 1*c–e*). There are two kinds of neurosetae. The upper neurosetae (figs. 1*f–h*) have two longitudinal rows of spinose scales. Similar but more delicate scales are

present on the lower neurosetae (fig. 1*i*); with spines, they are 20μ–25μ long. It could not be made out whether there are two or three rows, but in any case, the rows of scales are restricted to one-half to three-fifths of the circumference of the setae so that, in side view, usually only the cutting edge of the seta appears as pectinated. The spines on these scales are finer than those of the upper neurosetae, and there are almost twice as many spines per scale.

Only two thin, wrinkled, and colorless elytra (fig. 1*j*) are left. Among fairly numerous conical microtubercles of 20μ–30μ height (fig. 1*k*) there are some filiform papillae, which become very numerous toward the outer margin of the elytron. Very conspicuous is a row of conical macrotubercles about 110μ high (fig. 1*l*).

The color of the body is yellow brown in reflected light. The parapodia of the paratype, collected in February, are filled with exceedingly numerous, loose, and almost round eggs of about 65μ diameter from setigers 7 or 8 onward.

The fragment of a juvenile collected in July, with a width of almost 2 mm with parapodia but without cirri, and 0.7 mm without parapodia, shows the same characters as the adults, except that the prostomium is more pointed and the number of setae is small; all elytra had been lost.

The name refers to the row of macrotubercles on the elytra.

DIAGNOSIS.—A *Eunoe* species with blunt prostomium and disproportionately slender paired antennae. Notosetae with pointed tips. Two kinds of neurosetae. Elytra with conical microtubercles and one row of conical macrotubercles, and numerous filaments on the margins.

DIFFERENTIAL DIAGNOSIS.—*Eunoe uniseriata* is best characterized by its blunt prostomium, the slender paired antennae, the arrangement and form of the elytral macrotubercles, and the tips of the notosetae. There are few species with a blunt prostomium or reduced prostomial peaks among the *Eunoe* species listed by Hartman (1959, 1965b). Among these, *E. eura* Chamberlin, *E. sentiformis* Ushakov, *E. shirikishinai* Imajima and Hartman, *E. spinicirris* Annenkova, *E. subtruncata* Annenkova, and possibly *E. oerstedi* Malmgren have notosetae with blunt tips, which is not the case in *E. uniseriata*. Notosetae are pointed in *E. crassa* (Treadwell) and *E. nodosa dybowskyi* Augener, but the conical and other macrotubercles on the elytra are arranged differently from those on *E. uniseriata*. *Eunoe nodosa* (Sars) as described by Pettibone (1954, 1963) can have a blunt prostomium; there are papillae, however, in addition to the dorsal tubercles above the base of the dorsal cirri. Further, the very conspicuous row of macrotubercles near the external borders of the elytra are broad and rounded or jagged, not pointed as in the present species. Only one kind of neurosetae has been reported for *E. nodosa*.

Harmothoe fragilis Moore

Evarnella fragilis.—Hartman, 1959, p. 69.
Harmothoe fragilis.—Pettibone, 1963, p. 39.

One damaged incomplete specimen with eggs was collected in February 1963. Only the supracicular neurosetae are bidentate. The single remaining elytron conforms to figure 4, table 1, by Annenkova (1937) and figure b, table 6, by Imajima and Hartman (1964) for *H. impar* (Johnston). Pettibone (1963) already included Annenkova's record (as reported by Ushakov, 1955) in the synonymy of *H. fragilis*. We consider our specimen to belong to Moore's species because the European representatives of *H. impar* as described by McIntosh (1900) and Fauvel (1923) have inverted-conical or droplike papillae on the margins of the elytra, which is not the case with *H. fragilis*. Imajima and Hartman (1964) have doubted the justification of the genus *Evarnella* Chamberlin, and we follow them herein.

Found on station 6. New for Puget Sound. Previously recorded from southern California and the northwestern Pacific.

Hesperone complanata (Johnson)

Johnson (1901) stated that the paired antenna is less than half the length of the prostomium (cf. Pettibone, 1953, pl. 18: fig. 155). Johnson's largest animal was 21 mm long. In a small, incomplete animal, as well as in an incomplete specimen of 30 mm length with 26 segments, and in another fragment of about the same size, we find that the antennae are slightly more than half as long as the prostomia.

Family Polyodontidae

Peisidice aspera Johnson

A 5-mm-long specimen collected in May contains moderately numerous polygonal eggs of up to 105μ x 95μ, and one-third to one-half of this in the third dimension.

Four specimens of about 5 mm length, collected in daytime, have empty intestines, excepting one from station 6 that contains two sand grains of about 0.35 mm diameter.

Family Chrysopetalidae

Paleanotus bellis (Johnson)

Paleanotus bellis.—Hartman, 1961, p. 57.

In California material examined by Hartman (1961), the ventral tentacular cirri of the right side were lacking, and this asymmetry was thought to be characteristic of the species. The type-locality is Monterey, Calif. In Puget Sound material, the cirri are present in

five animals (apparently damaged in one); the cirrus is rudimentary in one. Thus, asymmetry of the front end is not the rule.

Family PHYLLODOCIDAE

Eulalia (*Hypoeulalia*) *bilineata* (Johnston)?

Eulalia bilineata.—Imajima and Hartman, 1964, p. 61.

Although there are great similarities of characters, the first segments in our six specimens are clearly separated from the prostomia as in *Eulalia* sensu stricto, rather than being fused with them as reported by Bergström (1914) for European material. Imajima and Hartman (1964) have found the same separation in Japanese animals, a fact that suggests the Pacific form is not identical with the European species. The ventral cirri of the second tentacular segments of our specimens are not filiform but slightly broader than the others.

Eulalia (*Eulalia*) *levicornuta* Moore

FIGURES 2*a–c*

Eulalia levicornuta Moore, 1909a, p. 346.
Not *Eulalia levicornuta*.—Berkeley and Berkeley, 1943, p. 130.

We consider a well-preserved anterior fragment to represent this species although it does not completely agree with the type-specimen (USNM 17288). Some additions to the description follow, based on the Puget Sound specimen.

The length (without proboscis, 125 segments) is about 20 mm. The greatest width (without parapodia) is 0.65 mm. The prostomium is quadrate except for the narrower anterior part (fig. 2*a*). The unpaired (broken) antenna inserts between the small eyes. The partially everted proboscis is densely covered with rounded, conical papillae except proximally; the smooth section is shorter than the proboscis is wide.

There is a fairly distinct dorsal furrow between the prostomium and the first segment. The first segment is not reduced dorsally and is enlarged laterally. The tentacular cirri are filiform except the ventral one on the second segment, which is slightly flattened. The dorsal tentacular cirri on the second and the third segments are about one-and-a-half times the length of the normal anterior dorsal cirri. There are setae on the second segment.

The parapodia (fig. 2*b*) have rounded lips of equal length. The dorsal cirri are thick and of a broad shape. The ventral cirri are slightly longer than the parapodia. There are approximately 15 setae per parapodium. The shaft of each seta ends in a conspicuous spine with secondary teeth on both sides (fig. 2*c*); the blade is long.

The color of the animal is pale brown; the dorsal cirri have a greenish tint.

Comparing our specimen with the description by Moore (1909a) we find that the form of the shafts of the setae is characteristic of *E. levicornuta*. In our animal, the median as well as the accessory spines are slightly stronger than in the type specimen, and are exactly as in Moore's figure (1909a, pl. 16: fig. 30). Moore stated that although

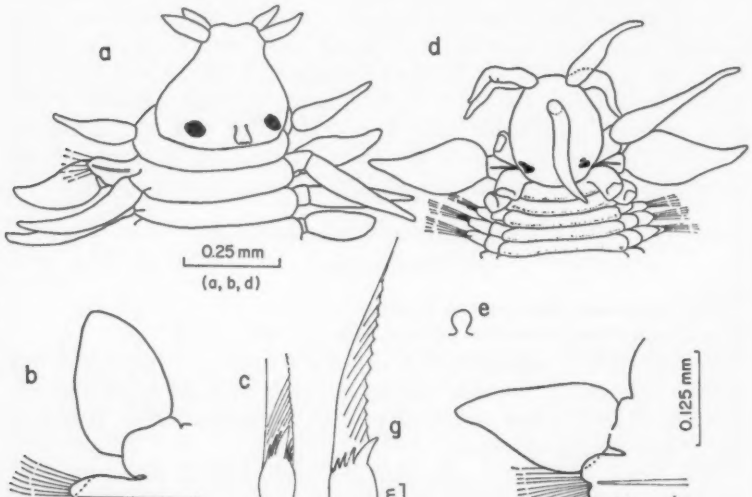

FIGURE 2.—*Eulalia levicornuta: a*, anterior end, from above and slightly from the left (proboscis and parapodium with ventral cirrus on third segment omitted); *b*, posterior view of 80th parapodium; *c*, terminal end of shaft of seta. *Eulalia parvoseta*, new species: *d*, dorsal view of anterior end (all dorsal cirri and part of tentacular cirri missing); *e*, papilla of proboscis; *f*, anterior view of 19th parapodium; *g*, seta.

the first segment is usually sharply separated from the prostomium, in one of his specimens they were dorsally almost continuous; this approaches the situation in our animal. The ventral cirrus of the second segment is flattened in the Puget Sound specimen contrary to the California material, but this character may be of lesser importance in view of the variability reported for *E. viridis* (Bellan, 1964). The length of the parapodia of our specimen is about one-third the body width, not one-fourth as with Moore's animals. The dorsal cirri in the type are rather leaflike, whereas in out animal they are fleshy.

Found on station 2. New for Puget Sound. Previously known from California. Berkeley (1924) had recorded a specimen for the coast of Vancouver Island but did not include it in the "Canadian Pacific Fauna" (Berkeley and Berkeley, 1948). This specimen is not in the Berkeley Collection of the U.S. National Museum (Dr. M. H. Pettibone, pers. comm.).

Two specimens collected in Wakeham Bay, near Ungava (Canada), on 2 September 1927 by Johansen and identified by Berkeley and Berkeley (1943) as *E. levicornuta* (USNM 32672) belong to another species of *Eulalia* sensu stricto. Among other characters, the shafts of the setae end in long spines of equal thickness.

Eulalia (*Pterocirrus*) *parvoseta*, new species

FIGURES 2*d–g*

Eulalia (*Pterocirrus*) sp. I Banse et al. [in press].

Holotype, USNM 36269, from station 5, 47°10′48″ N, 122°50′00″ W (February 1963).

There is one complete specimen (holotype), with about 50 segments, of 3.0 mm length (without proboscis) and 0.55 mm greatest width (without parapodia). An anterior fragment (fig. 2*d*) from station 4 with seven setigerous segments of slightly greater width was lost after the figure had been drawn.

DESCRIPTION.—The oval prostomium carries five long antennae. The unpaired antenna inserts somewhat posterior to the paired ones and reaches the third segment. The small eyes, without lenses, are near the posterior margin of the prostomium. The everted proboscis is 1.5 mm long and is densely covered with clavate papillae (fig. 2*e*), about 50μ high.

The first two segments seem to be fused ventrally. The first one is reduced dorsally. The four pairs of tentacular cirri originate from large cirrophores; that of the ventral cirrus of the second segment (V. II) is supported by a large acicula. All tentacular cirri are filiform except V. II, which is leaflike with a tip; its posterior margin is thicker than the anterior margin. The tentacular cirrus of the first segment is about as long, the cirrus of the second segment is about twice as long, and the one of the third segment is about two-and-one-half times as long as V. II (see fig. 2*d*). There are no setae on the second and third segments, but on the third segment there is a reduced parapodial lobe, about two-fifths the length of the following one. Its acicula is much thinner than that in the cirrophore of V. II. The tentacular formula thus is $1+0\frac{01}{a1}+0\frac{01}{aN}$.

The parapodia have rounded lips of about equal length. The dorsal cirri are broadly lanceolate (fig. 2*f*); toward the posterior end of the

animal their length is about twice their width. The ventral cirri are oval and slightly longer than the parapodia. In the type specimen, the number of setae per parapodium is about 10, and in the second fragment it is about 15. The ends of the shafts of the setae are 6μ–7μ thick and have large fangs with a few secondary teeth (fig. 2*g*). The blades are very short (20μ–25μ). Anal cirri were lost.

The color of the animals is pale greenish with marked black pigment bands dorsally on the posterior margin of each segment.

The name refers to the noticeably short blades of the setae.

DIAGNOSIS.—A small *Pterocirrus* species with an oval prostomium, small eyes, and a long unpaired antenna. Clavate papillae on proboscis. First segment dorsally reduced. Shafts of setae with large fangs and very short blades.

DIFFERENTIAL DIAGNOSIS.—The species belongs to the subgenus *Pterocirrus* Claparède of *Eulalia*, as defined by Banse (1959; see also Day, 1960). It is distinguished from the type-species, *E.* (*Pterocirrus*) *macroceros* (Grube) (cf. Banse, 1959), by the oval shape of the prostomium, the small size of the eyes, the clavate papillae on the proboscis, the toothed tips of the shafts, and the short blades of the setae. Possibly also *E. marginata* Claparède (see Rullier, 1964) belongs to *Pterocirrus* as defined now, although Claparède (1868) stated that all cirrophores of the second and third segments are supported by aciculae. The new species differs from *E. marginata* in this character, the small eyes, the toothed ends of the shafts, and the short blades of the setae.

Phyllodoce (*Anaitides*) nr. *multiseriata* Rioja

FIGURE 3*a*

Phyllodoce (*Anaitides*) *multiseriata* Rioja, 1941, p. 684.

There is one broken specimen, presumably a mature male, from station 2, August 1963. The animal is at least 25 mm long and about 0.75 mm broad (without parapodia). It is particularly distinguished by the proximal papillae of the proboscis, which form seven or eight fairly irregular rows of about nine round papillae each on both sides. The papillae leave broad mid-dorsal and midventral gaps, the dorsal one tending to be V-shaped. Because of its broad base, the shape of the dorsal gap is not nearly as regular as shown by Rioja (1941, pl. 1: fig. 2). There is a tiny nuchal papilla. Only the ventral tentacular cirri of the second segment are left, which are filiform and three-fourths as long as the body is wide. Setae start on the third tentacular segment.

The parapodia have large supra-acicular lips (fig. 3*a*). Cirri are preserved only in median-posterior segments. There are about a dozen setae per parapodium. Their shafts end in numerous small teeth; the

blades are long. The color of the animal is pink with dark intersegmental furrows.

The form bears some resemblance to *P. multiseriata* Rioja, which, however, has 12 pairs of rows of papillae with 11–15 papillae in the long rows. Also, Rioja (1941) emphasized the V-shaped form of the dorsal gap. On the other hand, the large supra-acicular lips of the parapodia (stressed by Rioja in the text rather than in the figures) support our tentative identification. Hartman (1961) has described

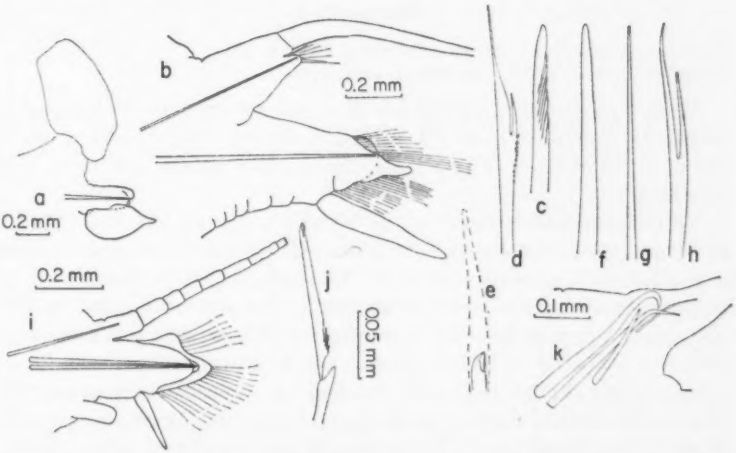

FIGURE 3.—*Phyllodoce* nr. *multiseriata: a*, posterior view of medioposterior parapodium. *Gyptis brevipalpa* (setae not drawn to scale): *b*, anterior view of median parapodium; *c*, thick notopodial spine; *d*, forked notopodial seta; *e*, tip of neuropodial compound seta; *f–h*, notopodial setae, including a thick capillary seta, from type of *G. brevipalpa* (figs. *f–h* by G. Hartmann-Schröder). *Micropodarke dubia: i*, posterior view of median parapodium; *j*, compound seta. *Sigambra tentaculata: k*, seta and acicula of a median notopodium squeezed under the cover glass (outline of basis of dorsal cirrus sketched).

an *Anaitides* nr. *multiseriata* with 12 pairs of lateral papillae. Her specimen had a nuchal papilla that in Rioja's animals was reported to be wanting..

Our form is not similar to any other known member of the subgenus *Anaitides* from the temperate northeastern Pacific.

Phyllodoce (*Anaitides*) *williamsi* (Hartman)

Anaitides williamsi Hartman, 1936, p. 126.

Our six specimens have about nine papillae per row on the proboscis, approximately rectangular dorsal cirri, rounded ventral cirri, and three bars across the dorsum of median segments, all of which support the identification. Adding to the description, we note that there are no

setae on the second tentacular segment, as to be expected in the subgenus *Anaitides*. A female with polygonal eggs of up to 75μ diameter was collected in February.

Found at stations 1, 5, and 8. New for Puget Sound. Previously known from Oregon and California.

Family HESIONIDAE

Gyptis brevipalpa (Hartmann-Schröder)

FIGURES 3*b–h*

Ozydromus brevipalpa Hartmann-Schröder, 1959, p. 105.
Ozydromus arenicola glabra Hartman, 1961, p. 68.

Many specimens are available that are referred to *G. brevipalpa*, originally described from El Salvador, despite minor differences in the notopodial setae. The largest, though incomplete, specimen is 17 mm long.

No cilia are visible between the 10 widely spaced terminal papillae of the proboscis. Occasionally the unpaired antenna seems to arise from a small elevation rather than from the straight anterior margin of the prostomium. Also, the posterior margin of the prostomium is straight. The longest tentacular cirri reach the twelfth setiger. Tentacular as well as dorsal cirri on body segments can be annulated with the joints being slightly shorter than wide, or they can appear pseudoannulated. The dorsal cirri are alternately short and long; the long cirri surpass the short cirri by about one-half their length and are almost as long as the body (without parapodia) is wide. Anal cirri are smooth.

Notosetae are absent on the first three or four setigers although aciculae are present dorsally. In posterior notopodia (fig. 3*b*) there are three to four short, nearly smooth spines about one-half as thick as the aciculae (fig. 3*c*) and about twice as many forked setae with flattened blades and short spurs, distinctly serrated (fig. 3*d*). The greatest width of the blades is about 5μ. In addition, two very long slightly curved capillaries can occur, which are finely serrated on the convex sides. The neurosetae have serrated blades that are almost smooth distally. The tips are excavated (fig. 3*e*). The blades may occasionally have hoods as indicated by the broken line in the figure; also one of the notopodial forked setae was found with such a hood. The tips of the shafts of the ventral neurosetae are slightly bifid when seen from below. The proximal parts of all setae, but not of aciculae, are distinctly 2-layered, the core being transversely barred. A specimen collected in February is packed with many polygonal eggs of about 60μ–70μ diameter.

Dr. G. Hartmann-Schröder inspected the type of *G. brevipalpa*, provided drawings, and permitted us to add the following to the description:

Notopodial setae appear on the fifth setiger. There is an upper short, needle-like bristle, subdistally finely serrated [fig. 3*f*]. There are two thin, smooth capillaries almost twice as long [fig. 3*g*]. There are usually three forked bristles which appear to be smooth with 20 × 100 magnification [fig. 3*h*]. With the same magnification, a very fine serration of the blades of neuropodial setae can barely be seen.

The type of *O. arenicola glabra* was studied at the Allan Hancock Foundation and was found to have forked setae, as in figure 3*d*, from the fourth and fifth setigers. Also, some neuropodial setae are hooded. Another specimen, studied in sample 4829, has notopodial setae as in figure 3*c*.

The forms differ from *G. arenicola* (La Greca) in the absence of cilia on the proboscis and the presence of the forked notosetae. Apparently, the articulation of cirri is not a useful character, in view of the variability of the present material and our experience with *Micropodarke dubia*, wherein regenerating cirri are not clearly annulated (see below). The insertion of the unpaired antenna does not seem to be of significance either. Neither Dr. O. Hartman nor we wish to separate material from California and Washington from the Central American species on the basis of details in notopodial setae. *Gyptis capensis* (Day) seems very close to *G. brevipalpa* and is perhaps identical.

Found at stations 2, 4, 5, 7, and 8. New for Puget Sound. Previously known from California and Central America.

Micropodarke dubia (Hessle)

FIGURES 3*i*, *j*

Kefersteinia dubia Hessle, 1925, p. 32.
Micropodarke dubia.—Imajima and Hartman, 1964, p. 83.

There are many broken specimens that agree with the description by Hessle (1925) except that the everted proboscis has about 25 fairly regularly spaced terminal papillae with some additional supernumerary ones, rather than "about 20."

Adding to Hessle's description, the dorsal tentacular cirri can be quite long, the longest reaching the fourteenth setigerous segment. Regenerating cirri are not clearly annulated. The ventral tentacular cirri are about as long as the body is wide. Lobes that originate slightly posteriorly to the bases of the parapodia reach two-thirds the length of the parapodia in the first three or four setigerous segments; they are about four times as long as they are wide. Posteriorly they are much shorter (fig. 3*i*). The anterior lips of the first parapodia are almost bilobed as described by Okuda (1938) for *M. anemiyai* Okuda (this record has already been considered a synonym of *M. dubia*

by Imajima and Hartman, 1964). A compound seta is shown in figure 3*j*.

Fairly numerous polygonal eggs of up to 60μ diameter are filling the parapodia of a specimen collected in May at station 5. The species seems to be a selective deposit feeder: Intestines of specimens from station 5 (mean particle size 0.45 mm) are primarily filled with fine materials; in addition, there are sand grains smaller than 0.05 mm. Some sand grains and diatom frustules of more than 0.1 mm shortest dimension are also present.

There is no doubt that our specimens belong to Hessle's species; however, the genus *Micropodarke* Okuda, based on only one specimen of *M. anemiyai*, is said to have no notopodial aciculae, that is, to have uniramous parapodia. In view of the variability in the number of notopodial aciculae reported by Hessle (1–3; in the specimens checked by us, 1–2), it is feasible that Okuda's specimen was exceptional. If this is the case, the generic diagnosis for *Micropodarke* should be amended. The genus would then be very close to *Nereimyra*, except that there are no jaws in *Micropodarke*. Also *N. punctata* (Müller) has the mentioned lobes (fig. 3*i*) mediad to the ventral cirri (Banse, 1956). Other close genera are *Parasyllidea* Pettibone and possibly *Neopodarke* Hartman, both with slightly different termination of the proboscis; the latter genus lacks notopodial aciculae. Since the armature of the proboscis is not a very practical character, it is doubtful that all of these mostly monospecific genera should be retained. *Nereimyra* would take precedence over the other names.

Found at stations 1, 4, 5, and 8. New for the eastern Pacific. Previously known from Japan.

Family PILARGIDAE

Sigambra tentaculata (Treadwell)

FIGURE 3*k*

Ancistrosyllis tentaculata.—Hartman, 1947a, p. 498.
Sigambra tentaculata.—Pettibone, 1966, p. 182.

There are several animals. The longest one has at least 135 setigers and is 2 cm long.

The deeply indented posterior margin of the prostomium is rarely visible. The proboscis has 12–13 triangular closely spaced terminal papillae of equal size and also some medium-sized papillae on the outside. There seems to be some variability of this character—14 in the type (Pettibone, 1966), 8 in other Atlantic material (Hartman, 1965a). The curved notopodial hooks are usually found from the third setigerous segments onward, rather than from the fourth as in the type material from Long Island Sound (Pettibone, 1966); occasionally they begin with the fourth setigerous segment in our material. A fine

short capillary seta may be present (fig. 3*k*). In the median and posterior parapodia short, thick spines occur, which are not as strongly bent as the aciculae. Neurosetae are all spinose. In short ones, the hairs are as long as the shafts are wide, so that the setae appear comblike. In the longest thin setae, the serration becomes just visible under ×400 magnification.

Found at stations 6–8. New for Washington waters. Previously known in the North Pacific from southern California.

Family Syllidae

Eusyllis blomstrandi Malmgren

Figures 4*a–c*

Adding to the description of the Pacific and Arctic material (Pettibone, 1954), we note that the pharynx opening in our material is

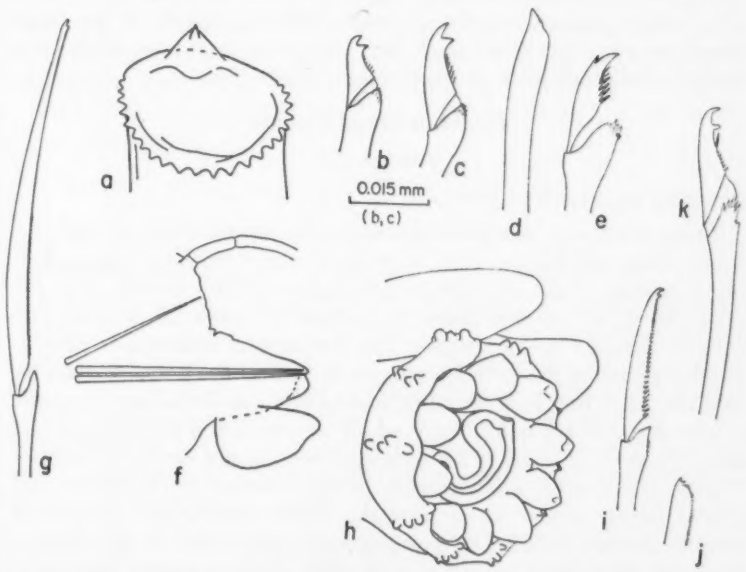

Figure 4.—*Eusyllis blomstrandi: a*, opening of pharynx; *b* and *c*, setae from a median parapodium. *Exogone lourei* (setae not drawn to scale): *d*, tip of upper simple seta, *e*, compound seta with short blade. *Pionosyllis uraga: f*, posterior view of median parapodium with a dorsal acicula (neurosetae not shown); *g*, compound seta with long blade. *Syllis harti: h*, partly everted pharynx from the lower right hand side (the palps are indicated); *i*, blade of median seta from 41st parapodium of type. *Dorvillea pseudorubrovittata* (setae not drawn to scale): *j*, tip of simple, flattened seta; *k*, compound seta.

chitinous with the usual large dorsal tooth and small teeth on about three-fourths of the circumference (fig. 4*a*); it thus differs from the material of Malmgren (1867) and Imajima (1966). Two rows of soft papillae encircle the outside of the pharynx. The proventricle has 50 to 70 rows of papillae and is followed by a pair of spherical caeca. The dorsal cirri, annulated in the anterior region of the body, are smooth in the middle and posterior regions. Setae from the middle region of the body have short blades (figs. 4*b*, *c*). Setae with long, straight blades as reported by Berkeley and Berkeley (1945) for animals from Vancouver Island are absent in our animals. Swimming setae occur from setigers 17 or 18 onward.

Exogone lourei Berkeley and Berkeley

FIGURES 4*d–e*

There are several specimens. An inspection of the type (USNM 32895) showed that the proventricle is rather long, extending from the third to the sixth setiger (fourth to seventh in our specimens). In a median parapodium of one of our specimens, the tip of the simple dorsal seta is slightly serrated (fig. 4*d*); compound setae with short blades have small teeth above the main fangs (fig. 4*e*).

Pionosyllis uraga Imajima

FIGURES 4*f*, *g*

Pionosyllis uraga Imajima, 1966, p. 114.

There are many anterior fragments with up to about 30 setigers, 4 mm long and 0.7–0.8 mm at greatest width (without parapodia). Commenting on the description by Imajima (1966), we note that the proventricle of our specimens has about 35 rows of papillae and extends through 12–14 setigers. The dorsal cirri alternate in length. The long ones of the anterior setigers as well as the dorsal tentacular cirri are 1.5–2 mm long. Farther posteriorly, the dorsal cirri decrease in size and are twice the body width at about the thirtieth setiger although there are cirri of 2 mm length even on the twentieth setiger.

Neuropodial setae are numerous in the anterior 12–15 setigers and appear faintly yellow in direct light. Subsequently the number of setae is sharply reduced to approximately 20 or less. In this region, there are up to four neuropodial aciculae. In one animal there is a dorsal acicula but natatory setae are absent (fig. 4*f*). The uppermost setae with very long blades (about 100μ, fig. 4*g*) have faintly serrated cutting edges at their bases and bidentate tips. The compound setae with blades of ordinary length (25μ–40μ) have strongly spinose cutting edges, except the lowermost ones with the shortest blades. The ends of the shafts of these setae are slightly serrated but do not

have hairs as stated by Imajima (1966). There is very faint serration at the tips of the shafts of the upper compound setae as well.

Found at stations 5 and 6. New for the eastern North Pacific. Previously known from Japan.

Syllis (Typosyllis) harti Berkeley and Berkeley

FIGURES 4*h*, *i*

Our many specimens have been compared with the type material (USNM 32671), and we can add to the description by Berkeley and Berkeley (1938): The pharnyx extends through the tenth to twelfth setigers. There are the usual 10 soft papillae on the outside and, alternating with them, rows of four small soft papillae (fig. 4*h*). The proventricle has 40–60 rows of papillae and extends in the type through 12 setigers and in our material through 9–11 setigers. The ends of the shafts of median (fig. 4*i*) and lower setae from the thirteenth and forty-first feet of the type bear minute teeth. The blades are coarsely serrated and have subbidentate tips. The blades of the upper setae are about twice as long as those of the median setae but are less coarsely serrated and have bidentate tips (fig. 4*i*; see also original description, Berkeley and Berkeley, 1938).

The species reproduces by stolons. The intestines of all our specimens are empty.

Family NEREIDAE

Platynereis bicanaliculata (Baird)

Platynereis dumerilii agassizi.—Berkeley and Berkeley, 1948, p. 60.

Paragnath groups VII and VIII of specimens from the San Juan Archipelago collected by M. H. Pettibone (USNM 28458, 28460, 28463, and 28464) form five subgroups of pectinate paragnaths (sometimes in a double row), rather than a continuous band as stated by Hartman (1954) for *P. bicanaliculata* from Vancouver Island. Ehlers (1868) described six subgroups of two rows each for his *P. agassizi* from the Strait of Georgia and from Mendocino (see also Izuka, 1912).

Family NEPHTYIDAE

Nephtys assignis Hartman

Nephtys assignis Hartman, 1950, p. 112.

A fairly relaxed specimen with about 145 setigers is just 20 cm long. Found at stations 2 and 7. New for Puget Sound. Previously known from southern California and Guatemala.

Nephtys ferruginea Hartman

This species has not been reported previously to possess recurved aciculae, but they are clearly recurved in our many specimens. The interramal cirri usually point downward or may appear to be involute; however, the pigmentation pattern, the appearance of the interramal cirri on the third setiger, and the shape of the posterior neuropodial acicular lobe make identification certain.

Usually, the intestinal content is not conspicuous even in transparent posterior ends. A specimen with sediment boluses in the posterior intestine was dissected and was found to have numerous syllid bristles engulfed in the sediment.

Females with eggs and young specimens, the latter presumably belonging to this species, were observed from February through July.

Family SPHAERODORIDAE

Sphaerodoridium sphaerulifer (Moore)

Spaerodorum sphaerulifer.—Ushakov, 1955, p. 222.
Spaerodoridium sphaerulifer.—Lützen, 1961, p. 415.

Found at stations 4 and 7. New for Puget Sound. Previously known from California, the Sea of Okhotsk, and the Sea of Japan.

Family GLYCERIDAE

Glycera Savigny

In addition to a note on *G. siphonostoma* (della Chiaje), we report observations on the intestinal contents of other species of this genus, occurring locally.

Glycera siphonostoma (delle Chiaje)

Glycera siphonostoma. —Imajima and Hartman, 1964, p. 164.

Our specimens agree with the description by Imajima and Hartman (1964): Each aileron has a connecting plate, there are ridges on the proboscidial organs, the prostomium is 9-ringed, branchiae are absent, there are pointed postsetal lobes that are much shorter than the presetal lobes, and there are large ventral cirri. The ventral cirri of middle parapodia of our specimens reach nearly to the presetal lobes, agreeing with the figures given by McIntosh for the species (1910; pl. 76; fig. 2b).

Found at stations 2, 7, and 8. New for Puget Sound; hitherto known in the Pacific from Japan.

Intestinal Contents of Local *Glycera* species

Intestinal contents of the midportion of animals were studied, or squeezed specimens were inspected (as indicated). All the material had been collected in the daytime. Three specimens of *G. americana* Leidy (about 3.5, 5, and 10 cm long) had empty intestines. A 5-cm-long specimen of *G. capitata* Oersted (including *G. nana* Johnson; see Banse et al., in press) had an empty intestine as seems to be the rule with the species (from inspection). A 4-cm-long animal from station 7 contained a few boluses of sediment that were full of setae of *Sigambra tentaculata*, together with fine sediment material and sand grains up to about 0.075 mm diameter. Specimens of *G. siphonostoma* (two of 2 cm, one of 6 cm length; from inspection) had empty intestines. A 35-cm-long specimen of *G. robusta* had an empty middle intestine; a 25-cm-long animal contained a small amount of sediment particles together with many bristles, possibly of Aphroditidae.

The observations of largely empty intestines corroborate the findings by earlier investigators (see Klawe and Dickie, 1957; Sanders et al., 1962). According to these authors, who quote earlier studies, Glyceridae may be considered deposit feeders that swallow larger animals incidentally. Our material is not large enough to investigate whether the grain size composition of the intestinal content is that of the habitat; the organization of the proboscis would suggest nonselective deposit feeding only.

Family Goniadidae

Goniada maculata Oersted

Goniada maculata.—Støp-Bowitz, 1941, p. 209.—Hartman, 1950, p. 20.

Found at stations 1, 3, 4, 6, and 8. New for Puget Sound. Previously known in the Pacific from Kodiak Island and the northwestern Pacific.

Family Lumbrineridae

Lumbrineris Blainville

In addition to a morphological note on *L. californiensis* Hartman, we make observations on the intestinal contents of several other species of this genus occurring locally.

Lumbrineris californiensis Hartman

Lumbrineris californiensis Hartman, 1944, p. 163.

In specimens of 4–5 cm length and about 1 mm width (without parapodia), composite hooks are found only to the fifteenth or six-

teenth setiger, rather than to the twenty-fourth to thirtieth or a little beyond as in California material 8.5–13 cm long (Hartman, 1944).

Found at stations 1, 3–6, and 8. New for Puget Sound. Previously known from California.

Intestinal Contents of Local *Lumbrineris* species

From inspection of entire animals, we note that the intestines of specimens of the local species of one to a few cm length are filled only to about one-fourth of their length, sometimes less. The sediment occurs in boluses at least in the middle and posterior sections of the body. Dissection of two specimens each of four species showed the following (width is without parapodia; all animals had been collected in the daytime):

Lumbrineris bicirrata Treadwell.—The intestinal contents of a posterior fragment from station 4 of 3 mm width contained sand grains up to 0.2 mm wide, inbedded in a fair amount of organic and inorganic fine material. The intestinal contents of an almost 10-cm-long specimen of 6 mm greatest width from station 2 were a large amount of fine sediment with some diatom frustules and sand of up to 0.15 mm diameter. In neither case could recognizable organic remains be seen.

Lumbrineris californiensis Hartman.—The hind intestine of a small individual (about 1 mm wide) from station 7 contained very fine sediment of less than 0.01 mm grain size and two healthy looking nematodes. A specimen about 1.5 cm long and 1 mm wide from station 1 contained fine detrital material, with a few sand grains up to 0.15 mm in diameter, and several pieces of a terrestrial plant epidermis about the same size.

Lumbrineris cruzensis Hartman.—A young specimen about 1 cm long in length and <1 mm wide from station 1 contained fine detrital material, with a few sand grains $\leqq 0.07$ mm in diameter. Many other specimens of approximately the same size from this station and station 7 had empty intestines.

Lumbrineris luti Berkeley and Berkeley? (for identification, see Banse et al., in press).—Two posterior fragments 1.5 cm long and about 1 mm wide from station 4 contained largely coarse material, including unbroken *Coscinodiscus* species frustules 0.2 mm in diameter.

Most specimens had sediment about the same grain size or particles smaller than the mean grain size of their habitat in their intestines, suggesting predominantly selective feeding. Because of the partial filling of the guts, it may be doubtful whether the species are exclusively selective deposit feeders as these have to cope with large amounts of sediment to obtain enough organic material. The absence

of animal remains (except for one specimen of *L. californiensis*), is certainly striking.

Earlier studies have suggested that *Lumbrineris* species are not carnivorous: *L. impatiens* Claparède feeds on macroscopic algae (Hempelmann, 1931); *L. minima* Hartman is a detrital feeder (deposit feeder) (Reish, 1959); *L. tenuis* (Verrill) and probably *L. fragilis* (Müller) are selective feeders as is the related *Drilonereis longa* Webster (Sanders et al., 1962).

Family Arabellidae

Notocirrus californiensis Hartman

Notocirrus californiensis Hartman, 1944, p. 175.

Found at stations 1, 3, 4, and 6. New for Puget Sound. Previously known from California.

Family Dorvilleidae

Dorvillea pseudorubrovittata Berkeley

Figures 4*j*, *k*

The setae were studied in the syntypes (USNM 32674). There are some superior thin capillary setae, slightly broadened in the distal third, where they are finely serrated The bidentate tips have the same outline as those of the thicker spines below (fig. 4*j*), which are slightly broadened and coarsely serrated in the distal halves. The serration near the bifid tips is fine. Rioja (1962) has not mentioned the bifid tips. The ends of the compound setae are serrated (fig. 4*k*). The spurs below the secondary teeth of the blades can be as small as in our figure, or they can form a membrane on the cutting edges of the blades reaching their tips.

Family Paraonidae

Aricidea (*Aricidea*) *ramosa* Annenkova

Figures 5*a–d*

Aricidea? (*Aedicira*) *ramosa*.—Hartman, 1957, p. 312, p. 327; 1959, p. 371.
Aricidea (*Aedicira*) *ramosa*.—Hartman, 1963, p. 37.
Aedicira ramosa.—Hartman, 1965b, p. 50.

We have 15 individuals, 2 of which are complete and have about 80 setigers. The antenna is short and palmately divided into three to five fairly equal lobes (fig. 5*a*); Annenkova described longer lobes. There are 13–17 pairs of gills beginning on setiger 4. Notopodial

postsetal lobes are short in the anterior and longer in the posterior segments.

The character of the neuropodial setae changes at the fortieth to fiftieth setigers, where some setae taper abruptly (fig. 5*b*). Two or three setigers farther, modified setae, usually with an arista, are also present (fig. 5*c*). The pygidium of one specimen is well preserved and has three ventral cirri, a short median one and two longer ventrolateral ones (fig. 5*d*).

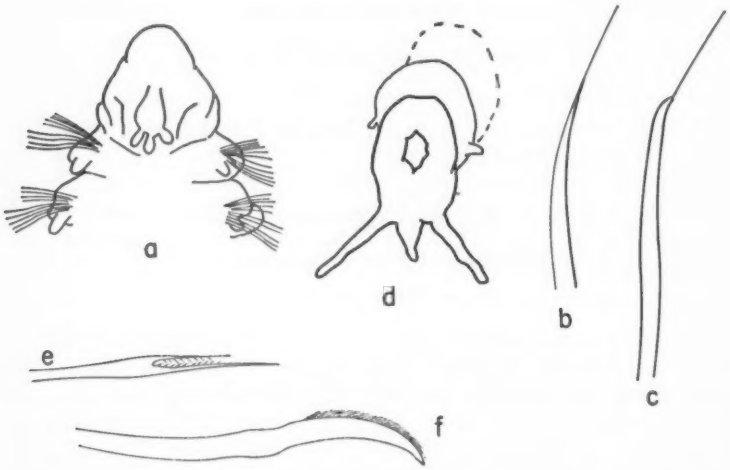

FIGURE 5.—*Aricidea ramosa: a*, dorsal view of anterior end; *b*, seta from about the 40th neuropodium; *c*, modified neuropodial seta; *d*, posterior view of pygidium. *Paraonis lyra: e*, furcate seta from posterior notopodium. *Paraonis ivanovi: f*, posterior neuropodial hook.

The neuropodial hooks place this species in *Aricidea* sensu stricto not in *Aedicira* as tentatively suggested by Hartman (1957).

Found at stations 4, 6, and 7. New for Puget Sound. Previously known from the Sea of Japan and southern California.

Paraonis (*Paradoneis*) *lyra* Southern

FIGURE 5*e*

Paraonis (*Paraonides*) *lyra* Southern, 1914, p. 94.
Paradoneis lyra.—Hartman, 1965a, p. 140.

Our single specimen has a prostomium longer than wide. It lacks the ciliated papilla on the anterior margin figured by Southern (1914), but this may be an artifact of preservation. There are 14 pairs of

gills beginning on the fourth setiger. Furcate setae are present in the notopodia beginning on the last few branchial segments (fig. 5*e*). They differ from those figured by Southern in having spines on the inside of both arms, rather than on the inside of the long arm only.

Found at station 4. New for the temperate northeastern Pacific. Previously known from the northern Atlantic and southern California.

Paraonis (*Paraonis*) *ivanovi* Annenkova

FIGURE 5*f*

Paraonis ivanovi.—Hartman, 1957, p. 333.

Our specimens have conical prostomia and no eyes, five to six prebranchial setigers, and 10–16 (usually 13) pairs of gills. The modified neuropodial, acicular setae are curved, and have hoodlike structures on the convex sides. The hooks resemble the figure of Annenkova (1934, fig. 1a) for *P. ivanovi* under × 400. Under × 1000, however, the hood appears to be feathered (fig. 5*f*), and further, it is noticeable only on the convex side of the hook, whereas Annenkova showed it on both sides of the hook. The pygidium of one specimen consists of one large median ventral lobe from which arise two lateral cirri.

Ushakov (1950) regarded *P. ivanovi* and *P. gracilis* Tauber as the same species; however, we find that the modified neuropodial acicular setae of *P. gracilis* specimens from near the type-locality (kindly sent by Dr. A. Eliason, from his station 2 in the southern Öresund; Eliason, 1920) are without hoods or any similar structures. We therefore consider the two forms to be different species, which are distinguished only by these setae, as far as we can see from the descriptions. The Swedish material did not allow a detailed comparison of other characters.

Found at stations 2–4 and 6–8. New for the eastern Pacific. Previously known from the Sea of Okhotsk and possibly from Murmansk (fide Ushakov, 1950). Ushakov (1955) has recorded *P. gracilis* sensu lato also from the Bering Strait, and Chukchi Sea.

Family APISTOBRANCHIDAE

Apistobranchus ornatus Hartman

Apistobranchus ornatus.—Hartman, 1965a, p. 144.

Numerous specimens were found in January at station 4 but not in April. They are characterized by their palps, if present, reaching to the fourth setiger, the absence of the ventral cirrus on the first setiger, the serrated postsetal neuropodial lamella on the fifth, and the large lobes on the postsetal neuropodial lamella on the seventh setiger. Notopodia

are present at least through the twenty-second setiger, and interramal cirri are present from the first through at least the seventh setiger. The setae of the first six (sometimes seven) parapodia appear bushy, as in California animals (Hartman, 1961), but contrary to Hartman's (1965a) description.

New for Puget Sound. Previously known from California.

Family SPIONIDAE

Laonice Malmgren

While describing a new species from Puget Sound, we found it necessary to study the types of *L. antarcticae* Hartman and *L. japonica* (Moore). We add here to the original descriptions of these species.

Laonice antarcticae Hartman

Laonice cirrata antarcticae Hartman, 1953, p. 40; 1959, p. 378.
Laonice antarcticae.—Hartman, 1965a, p. 147.

We consider *L. cirrata antarcticae* Hartman a species of its own as did Hartman (1965a), for the following reasons: In the two types of *L. antarcticae* (Naturhistoriska Riksmuseet, Stockholm, type no. 613), the dorsal sense organ reaches to about the thirteenth setiger. The gills start, barely visible, on the second setiger. On the fourth setiger, they are one-fourth as long as the notopodial postsetal lamella, and only on the sixth to tenth setiger do they attain the same length as the lamellae. In the segments immediately posterior to the gill-bearing region, the ridges connecting the notopodial lamellae with the dorsum occupy about one-fourth of the distance between the lamellae, as in *L. pugettensis*, and are otherwise inconspicuous. Hooks in the forty-sixth and fifty-seventh setigers have two teeth, side by side above the main fangs, as in Brazilian material (Hartman, 1965a).

Laonice cirrata (Sars)?

Our specimens differ from the European representatives as described by Söderström (1920) by having two small teeth rather than one, side by side above the main fangs of the ventral hooks (no exception in the four parapodia of two specimens studied). This is one of the characters by which Söderström distinguished his *L. bahusiensis* from *L. cirrata* (later authors have not separated these forms). According to Söderström, genital pouches begin with the former species at the fifteenth to seventeenth setiger, with the latter at the twenty-eighth to thirty-fifth setiger. Hartmann-Schröder (1965) has reported *L. cirrata* from Chile, with similar hooks as in our form. The Chilean form is clearly different from ours, as well as from Söderström's form, because of its short dorsal sense organ, although the beginning of brood pouches is not known.

In our material, the occipital tentacle inserts at the level of the first parapodium. The dorsal sense organ reaches the twenty-sixth to thirty-fourth setiger (average 29, S.D. 3.7, $n=6$). The first occurrence of genital pouches ranges from the twelfth to twenty-eighth setiger (average 20, S.D. 4.5, $n=13$). In the largest animals, which are mature females, neuropodial hooks start at the forty-eight and sixty-second setigers; hooks occur in more anterior segments (thirtieth to thirty-fifth) in younger animals. In view of this variability we include our material, for the time being, in *L. cirrata* in spite of differences in the shape of the hooks.

Egg-carrying females are dark reddish-brown. The largest anterior fragment, with 62 setigers, is 5.5 cm long and 3.5 mm wide, without parapodia. The diameter of eggs taken from the coelom is slightly larger than 200μ, similar to Swedish material of both forms.

A juvenile animal had been regenerating the prostomium and five anterior setigers. The U.S. National Museum has an uncataloged adult specimen, also regenerating the anterior end.

Found at stations 1–4 and 6–8.

Laonice japonica (Moore)

Spionides japonicus Moore, 1907, p. 204.
Laonice cirrata.—Imajima and Hartman, 1964, p. 281 partim.
Not *Laonice japonica*.—Monro, 1933, p. 1047.

We consider *L. japonica* to be a species separate from *L. cirrata* (Sars), as suggested by Monro (1933), because of the beginning of genital pouches at the fourth to fifth steiger. Also, the dorsal sense organ reaches only to the eighteenth steiger in the holotype of *L. japonicus* (Acad. Nat. Sci., Philadelphia, type no. 1055) rather than to the twenty-eighth to thirtieth setiger as in *L. cirrata* (Söderström, 1920). The gills on the second setiger are half as long, and on the third setiger about as long as the notopodial postsetal lamellae. The holotype of *L. japonicus* has been collected off Japan at *Albatross* station 3771, not 5771 as stated by Moore (1907).

Monro (1933) has observed gills from the third setiger on a fragment from the Gulf of Panama identified as *L. japonica;* the dorsal sense organ extended to the twelfth setiger. Therefore, his form seems to be a different species.

Laonice pugettensis, new species

FIGURE 6*a*

Laonice cirrata.—Berkeley and Berkeley, 1936, p. 27 *partim*.
Laonice sp. I Banse et al. [in press].

TYPES.—Holotype: USNM 36263. Paratypes: USNM 36262 (4). Both from station 5, 47°10′48″ N, 122°50′00″ W (February 1963).

There are many anterior fragments from stations 1–3, 5, 6, and 8: mature females with up to 70 setigers about 3 cm long and almost 2.5 mm wide without parapodia, some posterior fragments that presumably belong to this species, and several anterior fragments of small individuals about 0.5 cm long and 0.5 mm wide.

DESCRIPTION.—The prostomium is broader than long and anteriorly flattened. There are two large crescentic eyespots and a distinct occipital antenna. The dorsal sense organ (caruncle) reaches to about the twenty-fifth setiger. The palps are lost in all specimens. Gills start at the second setiger and number 24 pairs in a well-preserved young animal, and 27, 32, and 33 pairs in mature females. The first pair is not quite as long as the notopodial lamella; the next two or three pairs, as well as the last one or two pairs, are shorter than the rest. A fully developed gill is shown in figure 6*a*. Notopodial postsetal lamellae in the middle of the gill-bearing region are auricular ventrally. Their distal ends are fairly blunt in adults (fig. 6*a*), whereas in younger specimens the tip is tapering in the long axis of the lamella so that the lamella appears to point upward. Posterior to the gill-bearing region a ridge from the notopodial lamella on to the dorsum occupies about one-fourth the distance between the cirri on each side in the holotype but is not distinct in the other large specimens. Genital pouches occur from the second to seventh setiger onward through at least the seventieth setiger.

Neuropodial hooks are found in an old and a young specimen from the thirtieth to thirty-third setiger onward. There are two secondary hooks side by side above the main fang. Dorsal hooks are absent on the anterior ends, as well as on the posterior end checked. Stout ventral neurosetae begin on the twenty-sixth and thirty-third setiger with two old individuals, at the twenty-fourth with the young animal mentioned above, and farther forward with another young specimen.

The pygidium has nine slender cirri that are slightly longer than the pygidium is wide; possibly their number varies. Polygonal eggs from genital pouches are about 125μ in diameter. The animals are yellowish pink.

The name refers to the type-locality.

DIAGNOSIS.—A small *Laonice* species with genital pouches from the second to seventh setiger. Dorsal sense organ (caruncle) to about the twenty-fifth setiger. Approximately 30 pairs of gills. Dorsal ridges posterior to the gill-bearing region inconspicuous. Dorsal hooks absent. Ventral hooks with two secondary teeth side by side above the main fangs.

DISCUSSION.—We follow Söderström (1920) in using the occurrence of genital pouches for separating species of the genus. Söderström has found a fairly close relation between the end of the atokous region

and the beginning of the brood pouches in three spionid genera. We note, however, that eggs can be seen through the body wall of three specimens of *L. pugettensis* only at the twenty-fifth setiger or slightly posterior to this segment although genital pouches start at the second to seventh setiger.

Omitting Monro's form, the known *Laonice* species with brood pouches starting before the tenth setiger may be distinguished as follows:

1. Dorsal sense organ (caruncle) to about the 25th setiger; dorsal ridges behind the gill-bearing region inconspicuous . . . . . **L. pugettensis** new species
   Dorsal sense organ not reaching the 20th setiger; dorsal ridges present or absent 2
2. Neuropodial hooks occurring before the 20th setiger . **L. appeloefi** Söderström
   Neuropodial hooks starting posterior to the 20th setiger 3
3. Gills distinct from second setiger onward; conspicuous dorsal ridges behind gill-bearing region . . . . . **L. japonica** (Moore)
   Gills distinct only posterior to second setiger; dorsal ridges inconspicuous. **L. antarcticae** Hartman

Laonice pugettensis is different from the incompletely known *Aricideopsis megalops* Johnson (1901) from Puget Sound, considered to be a species of *Laonice* (Hartman, 1959), because of hooks on the seventeenth somite in the latter. Also, neither the occipital antenna nor the gills on the tenth setiger of old or young specimens of the new species are as large as figured by Johnson.

A few records of *L. cirrata* from waters of British Columbia must refer also to *L. pugettensis* as evident from the description of the former species by Berkeley and Berkeley (1952). Further, an unnumbered sample in the U.S. National Museum, collected in Departure Bay, B.C., between 1918 and 1925, contains 15 *L. cirrata* and 2 *L. pugettensis* (cf. Berkeley and Berkeley, 1936).

Paraspio cirrifera, new species

FIGURES 6*b–f*

Paraspio sp. I Banse et al. [in press].

TYPES.—Holotype: USNM 36270. Paratypes: USNM 36271 (2) and 36272 (3). All come from station 3, 47°44′31″ N, 122°31′53″ W (February 1963).

Twenty-four specimens from stations 1, 3, 4, 6, and 8 are available. About half of our specimens come from station 3. The largest anterior fragment of a mature female has 73 setigers and a length of 21 mm. One complete animal possesses about 85 setigers.

DESCRIPTION.—The prostomium (fig. 6*b*) is rounded anteriorly. In most specimens there is a high bilobed protuberance on the upper side; in such a case, the eyes are not visible when the animal is seen

from the front (fig 6c). The posterior end of the prostomium is obtuse. Palps have been lost. There is a very small gill on the first setiger. In a well-developed parapodium (fig. 6*d*), the notopodial and neuropodial postsetal lamellae are present as usual. Also, there is a fairly large neuropodial presetal lamella and an interramal papilla. The gills are partially fused with the notopodial lamellae. Near the pos-

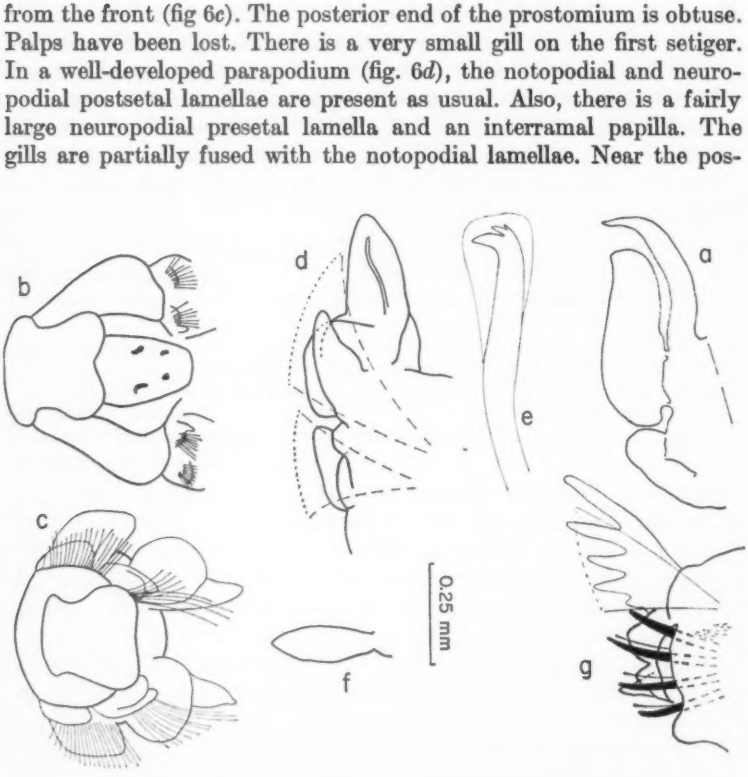

FIGURE 6.—*Laonice pugettensis*, new species: *a*, median parapodium (setae omitted). *Paraspio cirrifera*, new species: *b*, dorsal view of anterior end; *c*, frontal view of anterior end (setae of the first setiger are shown on the animal's right side, setae of the second setiger on the left side); *d*, anterior view of parapodium of 10th setiger (light broken lines indicate setae); *e*, hook from 25th parapodium; *f*, anal cirrus. *Trochochaeta multisetosa:* *g*, anterior view of third setiger (light broken lines indicate notosetae).

terior end of the animals, the lamellae are reduced, and the gills are long and straplike. In the tenth parapodium, a dorsal extension of the gill reaches forward, toward the origin of a most characteristic notopodial presetal cirrus, which is fairly round in cross-section. This cirrus is present at least through the twenty-fifth setiger but visible only in well-preserved material without dissection.

There are notopodial and neuropodial setae in the first setiger. The number of neurosetae is about 20. Apart from the wings, the setae appear dotted rather than striated. Tridentate neuropodial hooks

(fig. 6*e*) begin on the sixteenth to seventeenth setiger in young and mature specimens. There are fewer than 10 hooks per parapodium. Two ventral stout bristles start from the thirty-second or thirty-third setigers. Notopodial hooks are absent. There are four anal cirri (fig. 6*f*), round in cross-section and about 0.4 mm long.

Two large brown pigment spots occur on the prostomium behind its anterior constriction; sometimes similar pigmentation is present also on the anterior end of the lateral wings of the prostomium. There is some irregular pigment pattern dorsally behind the prostomium, and a thick band of pigment is found laterally on the peristomium. In the first 8 to 10 setigers, some brown pigment occurs in the intersegmental borders between the neuropodia and ventrally on both sides of the midline, separated by the pigment-free midline.

Polygonal eggs of about 250μ diameter are observed in one specimen (February). The animals construct a transparent fragile mucus tube.

The name refers to the presetal notopodial cirrus.

DIAGNOSIS.—A *Paraspio* species with an anteriorly rounded prostomium. Notosetae and a small gill on the first setiger. Dorsal presetal cirri in the anterior region of the body. Tridentate neuropodial hooks from setiger 16 or 17, ventral neuropodial acicular setae from setiger 32 or 33. Four elongated anal cirri.

DIFFERENTIAL DIAGNOSIS.—The new species may be distinguished from the members of the genus listed by Hartman (1959, 1965b; including *Microspio*) as follows: *P. africana* (Rullier), *P. armata* (Thulin), *P. minuta* Hartmann-Schröder, *P. kussakini* (Chlebovich), *P. theeli* (Söderström), and *P. wireni* (Augener) do not have tridentate hooks. Among the *Paraspio* species with tridentate hooks, *P. mecznikowiana* (Claparède) and *P. rolasiana* (Augener) lack setae in the first notopodium (as does *P. minuta*); *P. arctica* (Söderström) has a pointed prostomium (as does *P. theeli*). The presetal dorsal cirrus has been reported only for *P. africana* and *P. atlantica* (Langerhans); the latter species has been separated from *P. arctica* by Hannerz (1956). *Paraspio africana* has unidentate hooks and peculiar limbate notosetae; *P. atlantica* has a rather pointed prostomium, and its tridentate hooks start on the ninth segment.

Prionospio pinnata Ehlers

In our material, the third pair of gills is always only half as long as the first two pairs. There is no appendix on the third pair of gills as reported by Caullery (1915) for Malayan material.

Ehlers (1901) has implied that the species is a selective deposit feeder. Specimens from station 3 (mean grain size diameter 0.126 mm) have numerous sand grains not exceeding 0.07 mm imbedded in fine detrital material, which confirms Ehlers' observation.

Family Disomidae

Trochochaeta multisetosa (Oersted)

FIGURE 6*g*

Disoma multisetosum.—Hartman, 1959, p. 394.
Trochochaeta multisetosa.—Pettibone, 1963, p. 312.

There is one incomplete specimen from station 2. The dorsal postsetal lip of the third setiger is strongly digitate (fig. 6*g*); on the undissected animal, the uppermost lobe of the lip protrudes like a cirrus, which is not so on the preceding and following parapodia. There is no acicula in the notopodium. The shape of the notopodial lamella on the third setiger is very close to that drawn by Friedrich (1938, fig. 88b) from material close to the type-locality. We therefore assign the specimen to *T. multisetosa* rather than to *T. franciscanus* (Hartman). A detailed comparison of better preserved material from Puget Sound with the description of *T. franciscanus* by Hartman (1947b) would be desirable. *Trochochaeta franciscanus* is considered a synonym of *T. multisetosa* by Pettibone (1963).

New for Puget Sound. Previously known in the Pacific from Sakhalin.

Family Cirratulidae

Caulleriella alata (Southern)?

Because of the differences in the insertion of the palps and in the setation, we have some doubt that our animals are identical with the European *C. alata* (Southern), but we do not wish to decide on this before having studied material from other localities on the west coast of the Americas. As in *C. viridis pacifica* (Berkeley), the palps insert on the first setiger rather than on the preceding segment. *Caulleriella viridis pacifica* is considered a synonym of *C. alata* (Berkeley and Berkeley, 1950). In the first neuropods of our animals are 8 to 10 winged, bifid hooks and 1 to 2 capillary setae in small and large specimens (about 2–3 mm long, with 0.4–0.5 mm greatest width, and 1–1.5 mm long and 0.6–0.8 mm greatest width, respectively). Capillary setae can be absent in posterior neuropodia. Notopodial hooks are found from the forty-fifth to fifty-fifth setigers on, rather than from about the twentieth as in the European representatives (Southern, 1914). Notopodial hooks from the twentieth setiger have also been reported for *C. alata* from southern California (Hartman, 1961). Hartmann-Schröder (1962) has recorded hooks starting from the sixth and the seventeenth notopodia in Chilean material. Our form is certainly different from *C. alata maculata* (Annenkova).

Caulleriella annulosa (Hartman), new combination

FIGURE 7*a*

Tharyx annulosus Hartman, 1965a, p. 167; 1965b, p. 59.

Among *Tharyx* species kindly sent by Dr. O. Hartman, there are specimens of *T. annulosus* from station SL 4, off New England (Hartman, 1965a). There are acicular spines (fig. 7*a*) in neuropodia of the middle section of the body, and in both rami of the posterior section, in addition to capillary setae. These spines were not mentioned in the original description. We transfer the species therefore into *Caulleriella* as defined by Hartman (1961).

Chaetozone Malmgren

Because we have seen six North Pacific species of *Chaetozone*, a key for the temperate and subarctic North Pacific species is given. It considers primarily characteristics of the front end. *Chaetozone abranchiata* Hansen is not included in the genus on the basis of the original description (from Hansen, 1882; Levinsen, 1883) and that by Moore (1903), which report only capillary setae but not acicular spines. There are two North Pacific records that are not included in the key: Ushakov (1950) briefly described a *Heterocirrus* species with unidentate acicular spines starting in the fifteenth neuropod, which well might have been a *Chaetozone* species. Hartman (1963) mentioned a *Chaetozone* species from California with neuropodial spines present from the fifteenth segment.

1. Neuropodial spines from 1st setiger; spines posteriorly arranged in cinctures. **C. corona** Berkeley and Berkeley
   Neuropodial spines absent on 1st setiger but starting anterior to 15th to to 20th setiger 2
   Neuropodial spines starting posterior to 15th to 20th but anterior to 35th setiger; spines posteriorly not arranged in cinctures 3
   Neuropodial spines starting posterior to about 35th setiger 4
2. Neuropodial spines from 7th to 10th setiger; spines posteriorly not arranged in cinctures. Serrated capillary setae after the 7th to 10th neuropodium. **C. berkeleyorum,** new species
   Neuropodial spines from about the 10th setiger; long buccal region. Smooth capillary setae only. Posteriorly, 2 to 3 spines per ramus tending to form cinctures . . . . . **C. multioculata** Hartman
3. Neuropodial spines, fairly curved, from about the 17th setiger. Posteriorly, single spines without capillary setae in each ramus . **C. armata** Hartman
   Neuropodial spines from about 26th (18th to 40th) setiger. Short capillary setae in the middle region of body that appear to be broken off obliquely. **C. acuta,** new species
   Neuropodial spines from about 30th setiger. Long, ordinary, almost smooth capillary setae . . . . . **C. gracilis** Moore

4. Neuropodial spines, serrated at the tip, from the 35th to 40th setiger, posteriorly not arranged in cinctures. Capillary setae ordinary.
C. gracilis sensu Hartman (1961) (see below)

Neuropodial spines from the 45th to 90th setiger, posteriorly arranged in very marked cinctures. Capillary setae ordinary. . . **C. setosa** Malmgren

Neuropodial spines from about 70th neuropod, tending to form cinctures posteriorly. Long, threadlike capillary setae from about the 13th setiger.
C. spinosa Moore

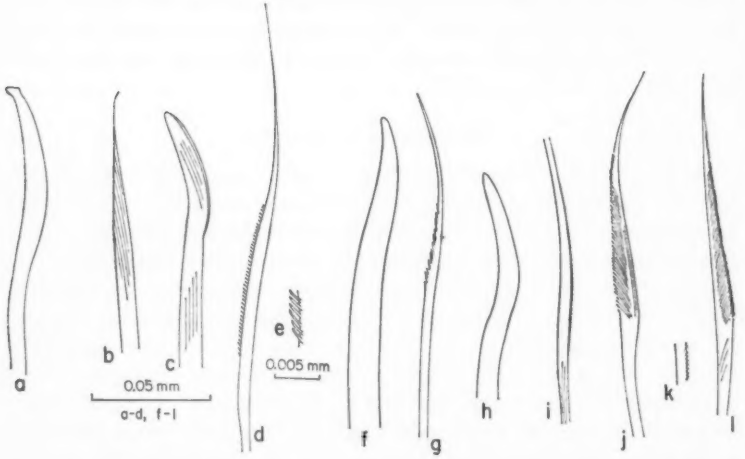

FIGURE 7.—*Caulleriella annulosa: a*, acicular spine. *Chaetozone acuta*, new species (seta from median foot): *b*, capillary seta; *c*, acicular spine. *Chaetozone berkeleyorum*, new species (setae from 40th neuropodium): *d* and *e*, capillary setae; *f*, acicular spine. *Chaetozone gracilis* (holotype, setae from about 85th setiger): *g*, capillary seta; *h*, acicular spine. *Tharyx secundus*, new species: *i*, detail of anterior capillary seta; *j*, neuroseta with short tip from 43rd setiger. *Tharyx serratisetis*, new species: *k*, detail of notoseta from 10th parapodium; *l*, serrated neuroseta from median region of body.

Chaetozone acuta, new species

FIGURES 7*b*, *c*

Chaetozone sp. I Banse et al. [in press].

TYPES.—Holotype: USNM 36275, from station 5, 47°10′48″ N, 122°50′00″ W (May 1963). Paratypes: USNM 36276 (2) and 36277 (2), from the same station (February and May 1963).

Many complete immature specimens of up to 155 setigers, 15 mm long and 1.1 mm wide, are at hand from stations 3, 5, 6, and 8, but no complete, mature individuals are available.

DESCRIPTION.—A cirratulid species with a conical prostomium on which one pair of eyespots is visible in freshly preserved material. There is a 2-ringed achaetous region that is about as long as it is

wide. Palps and the first pair of gills insert prior to the first setiger. Gills, which can be 5–7 mm long anteriorly, occur throughout the body but are mostly lost. The anterior setigers (at least 50) are crowded; posteriorly, the length of the segments becomes almost one-half their width. The setae of the posterior region originate from slight ridges which, however, are not nearly so pronounced as in *C. setosa* Malmgren. The anus is dorsal, with a crenulated margin dorsal and a ventral semicircular lip.

Anteriorly, there are about one dozen long capillary setae in each ramus, which are only slightly limbate. When bent, their fibers tend to separate with the result that the former cutting edges of the setae appear to be feathered. In the notopodia, prior to the occurrence of acicular spines, these setae gradually are replaced by shorter setae, which resemble obliquely broken-off bristles and have a finely drawn tip (fig. 7*b*). In the middle region of the body they are the only capillary setae present in noto- and neuropodia (two to four per ramus). In young animals near the end of the body, they are replaced by ordinary capillary setae. Acicular spines are slightly curved and have rounded tips and slight wings (fig. 7*c*). Ventrally, they occur from the eighteenth to thirty-eighth setigers onward (average 26; $n=11$). Dorsally, they begin 30–40 setigers posterior to the ventral spines. There are usually five to seven neuropodial, and two to five notopodial spines. Posteriorly, notopodial and neuropodial rami are only slightly separated laterally, but the spines do not nearly encircle the body. A posterior end of 51 setigers (10 mm long, 1.2 mm wide), apparently of a maturing female, and collected in May, carries in the last setigers dorsally four to five, ventrally five to six spines, with almost the same number of the described capillary setae (fig. 7*b*) between them. The setae are restricted to the sides of the body. There are numerous polygonal eggs of 50μ–60μ freely floating in the body cavity, including the last setigers.

The species seems to be a selective deposit feeder. The largest particles in the intestines of two specimens from station 5 (mean particle size 0.43 mm) are 0.05 mm in diameter; most are below 0.02 mm in diameter.

The name refers to the capillary setae of the middle region of the body.

DIAGNOSIS.—A *Chaetozone* species with ventral and dorsal acicular spines starting ventrally from approximately the twenty-sixth (range, eighteenth to fortieth) setiger, with slight wings. Short capillary setae, which appear to be obliquely broken-off, in the middle region of the body.

DIFFERENTIAL DIAGNOSIS.—For the characterization of the new species, it seems questionable how much significance is to be attached

to the wings of the acicular spines since they occur also in the local representatives of *C. setosa* Malmgren; this feature seems not to have been reported previously for *C. setosa*. Among the *Chaetozone* species listed by Hartman (1959, 1965b) to which *C. berkeleyorum*, new species, and *C. curvata* Hartmann-Schröder are to be added, the new species seems to be unique by the character of the capillary setae in the middle part of the body. For the characters distinguishing *C. acuta* from the other Pacific species, see page 31.

Chaetozone berkeleyorum, new species

FIGURES 7*d–f*

Caulleriella viridis pacifica.—Berkeley and Berkeley, 1942, p. 197.—Not Berkeley, 1929, p. 307 [fide Berkeley and Berkeley, 1950, p. 57].

Caulleriella gracilis.—Berkeley and Berkeley, 1950, p. 57; 1952, p. 37 partim. [Not *Chaetozone gracilis* (Moore); see p. 35 of this paper].

Chaetozone sp. II Banse et al. [in press].

TYPES.—Holotype: USNM 35286. Paratypes: USNM 36251 (2). All from the littoral of Skidegate Narrows, Queen Charlotte Islands. (Collected in 1935.)

There are two complete specimens and an anterior fragment from the littoral of Skidegate Narrows in the Queen Charlotte Islands, which are in the Berkeley Collection of the U.S. National Museum and which have been reported by Berkeley and Berkeley (1950), and one badly damaged anterior fragment from our station 7. The holotype is the largest specimen, has 72 setigers, and is 12 mm long, with 1 mm greatest width.

DESCRIPTION.—The prostomium is triangular but unusually blunt by being slightly broader than long. Eyes are not visible. The palps seem to insert on the anterior margin of the first setiger. In the vial from Skidegate Narrows, detached grooved palps of 4–5 mm length are present. In the Canadian animals, the segments lengthen in the general region of the fortieth setiger. In the Puget Sound specimen, only the approximate 10 first setigers are fairly crowded; thereafter they are about half as long as they are wide. There are very short gills above some of the notopodia, at least to about the sixtieth setiger. Even in posterior setigers, the segments are fairly cylindrical although with clear demarcations, in contrast to those of *C. setosa* Malmgren. The anus appears to be displaced dorsally.

In the anterior 8 to 10 setigers, there are less than a dozen each of dorsal and ventral capillary setae, some of them one-third the body width. Subsequently, the notosetae shorten. From the seventh to tenth neuropodium, one to three capillary setae appear that are slightly widened in their middle portion (fig. 7*d*). Two-thirds of the widened portion is finely serrated when seen under ×400. Scales

(rather than teeth) are well visible under ×1000 (fig. 7*e*). These capillary setae occur dorsally at least from the twenty-fifth setiger together with smooth ones. Starting from the seventh to tenth neuropodia, the widened capillary setae are accompanied by two to three smooth acicular yellow spines without wings (fig. 7*f*). About two to three notopodial acicular hyaline spines appear at about the forty-fifth setiger (not the twenty-fifth as stated by Berkeley and Berkeley, 1950). They are straighter than the neuropodial ones, and only as thick as the accompanying capillary setae. The spines do not encircle the posterior portion of the body. The serration of the notopodial capillary setae is weak.

The specimens from Skidegate Narrows had originally been misidentified as *Caulleriella viridis pacifica*, according to Berkeley and Berkeley (1950). The authors state in the same paper that *C. viridis pacifica* as described by Berkeley (1929) is a synonym of *C. alata* (Southern). The specimens on which the 1929 paper has been based are no longer available (Pettibone, 1967).

The new species is named for Edith and Cyril Berkeley.

DIAGNOSIS.—A *Chaetozone* species with blunt prostomium and fairly smooth posterior region. Smooth neuropodial spines without wings and serrated capillary setae from the seventh to tenth setiger. Thin notopodial spines from the forty-fifth setiger. Some notopodial serrated capillary setae.

DIFFERENTIAL DIAGNOSIS.—Among the *Chaetozone* species listed by Hartman (1959; 1965b) to which *C. acuta*, new species, and *C. curvata* Hartmann-Schröder are to be added, *C. abranchiata* Hansen, *C. atlantica* McIntosh, and *C. pacifica* McIntosh have only capillary setae, according to the original descriptions (for *C. abranchiata*, see p. 31). Among the others, neuropodial spines occur before the twentieth setiger in *C. andersensis* (Augener) (see Hartman, 1967; spines from ninth neuropodium; posteriorly, one to two per ramus); *C. armata* Hartman; *C. carpenteri* McIntosh (spines from about the tenth notopodium and neuropodium, with some very large spines among them); *C. multioculata* Hartman; and *C. gayheadia* Hartman (nearly straight spines from the first neuropodium; apparently no posterior cinctures). Spines can occur in *C. acuta* from the eighteenth neuropodium. None of the above species has serrated capillary setae. The distinguishing features for the North Pacific species are given on p. 31.

Chaetozone gracilis (Moore)

FIGURES 7*g*, *h*

Tharyx gracilis Moore, 1923, p. 187, partim.

Not *Caulleriella gracilis*.—Berkeley and Berkeley, 1950, p. 57; 1952, p. 37 [see p. 34 of this paper].—Hartman, 1960, p. 125.

Not *Chaetozone gracilis*.—Hartman, 1961, p. 111.

We include here a study of Moore's original material made when describing *Chaetozone berkeleyorum*. In the holotype of *C. gracilis* (USNM 17398) neuropodial hooks start at about the thirtieth setiger. They are smooth and have rounded tips (fig. 7*h*; also checked near the fiftieth setiger). The acicular spines are fairly inconspicuously arranged and do not encircle the posterior part of the body. The accompanying capillary setae (fig. 7*g*), which are quite similar to those in the notopodia, seem to be serrated, but this is irregular and might rather be a sign of decay of the setae. The oval eggs are up to 120μ by 95μ.

Moore's description fits the holotype only. The cotype (Acad. Nat. Sci., Philadelphia, no. 3097) had been dried up at some time but is clearly another species. Notopodial capillary setae, slightly longer than the body is wide, occur throughout the body. There are only capillary setae on the twenty-eighth to thirtieth setigers. The neuropodia of posterior setigers (past the hundredth) have only broad capillary setae with serration of the edges well visible under ×400, which are similar to those of *Tharyx secundus*, new species (p. 37). All setae are hyaline. The cotype thus seems to be a *Tharyx* species. Dr. O. Hartman (in litt.) suggested already that the holotype and the cotype of Moore's material may be different forms.

Neither species is identical with *Chaetozone gracilis* of Hartman (1961). This form is characterized by serrated neuropodial spines and is a species to be named.

Chaetozone setosa Malmgren

In our material, neuropodial spines occur from the forty-fifth to sixty-fifth setigers onward, and even from about the thirty-fifth to fortieth in specimens under 1 cm length, whereas Hartman (1961) reported for California animals a beginning at the seventy-ninth to nintieth setigers. The spines are faintly winged, similar to those of *C. acuta* described above although they are more pointed than in the latter species.

The species occurs at all stations, but, regardless of the sediment composition, the intestine is filled with masses of fine detritus, among which are some sand grains or diatom frustules that do not surpass 0.05–0.06 mm in diameter. The species is thus a selective deposit feeder, at least in coarse sediment.

Chaetozone spinosa Moore

Chaetozone spinosa.—Imajima and Hartman, 1964, p. 297.

There is one anterior fragment with 36 setigers, which is about 4 mm long. The first 12 setigers are crowded; the body attains its great-

est width of 0.5 mm here. Thereafter the setigers become longer, but the width is only 0.3 mm. Rudiments of palps and gills are visible. Whereas the neuropodial bristles in the crowded section of the body are all about normal length, there are some threadlike setae in the notopodia. From about the thirteenth setiger these occur in notopodia and neuropodia, with a length of 0.5–0.6 mm. At the beginning of the exposed part, their width is about 4μ, farther out only 3μ; the thickness is about 1μ here. These setae are "striated having a slight turn" as described by Moore (1903, p. 470); however, the scales observed on the large specimen from Japan could not be seen with ×1000 magnification in our material.

Acicular spines occur in the species from the seventieth neuropod onward (Hartman, 1960). Our identification is based on the threadlike setae.

Found at station 6 in May. New for Puget Sound. Previously recorded from Japan and California.

Tharyx multifilis Moore

Contrary to the original description by Moore (1909b), the anus of one complete specimen from Puget Sound is displaced dorsally by a very pronounced triangular ventral lip. This holds also for an individual from *Velero IV* station 5027–57 off Pt. Fermin, kindly sent by Dr. O. Hartman. Thus the separation from this species of *T. pacifica* Annenkova continues to be doubtful as also pointed out by Chlebovich (1961); *T. pacifica* has eyes, *T. multifilis* does not. The caudal ends of our two specimens are very slightly thickened (inflated), whereas Moore (1909b) and Hartman (1961) reported a slender tapering posterior end.

A large portion of the intestinal contents of two specimens from two hauls at the fine-sand station 4 (mean diameter 0.10 mm) is made up of grains of 0.07–0.10 mm diameter, with a very few larger (0.15 mm) particles present. Thus there seems to be only slight selection of particles when feeding.

Tharyx secundus, new species

FIGURES 7*i*, *j*

Tharyx sp. II Banse et al. [in press].

TYPES.—Holotype: USNM 36278. Paratype: USNM 36279 (1) drawings from paratype). All from station 3, 47°44′31″ N, 122°31′53″ W (February 1963).

There are several anterior and posterior fragments 1–2 cm long and 0.3–0.5 mm wide. In all, there are at least 100 setigers.

DESCRIPTION.—A pointed prostomium without eyes is followed by a 3-ringed achaetous region. The scars left by the broken-off palps at

the anterior margin of the first setiger are separated from each other by a gap that is as wide as their diameter. The gills of this segment arise between the palps and the notopod; on the following segments, they insert just above the notopod. Gills are at least 2 mm long and are found at least to the seventieth setiger (length of the largest anterior fragment, apparently a juvenile). Approximately the first 20 setigers are widened laterally, but the dorsum is low and not inflated. The external borders of the segments are dorsally well visible. In an anterior fragment of 65 setigers, 13 mm long, this anterior region is 2 mm long (of which the achaetous rings contribute 0.4 mm) and 0.5 mm wide. The anterior region is followed by more than 40 setigers, which are about as wide as they are long and are separated from each other by deep furrows. Sometimes they appear beadlike. Near the fortieth setiger, segments are 0.3 mm long and 0.3 mm wide. The parapodia arise on the hindmost portion of the segments. The posterior region consists of about 30 setigers, which are crowded and laterally widened (inflated). A posterior portion is 1.5 mm long. The anus is dorsal.

In the anterior region, all setae are capillary. Notosetae are half as long as the body is wide. By the twentieth to twenty-fifth setiger, the setae of both rami become limbate and weakly serrated (fig. 7*i*). The neurosetae shorten in the subsequent parapodia, become very broad, and are beset with distinct hairs on the cutting edge (fig. 7*j*). The serration is just visible under ×400, and thus the setae are not as strongly serrated as in *T. serratisetis* described below (under oil immersion, the neurosetae of local specimens of *T. multifilis* Moore are not quite smooth either but do not appear to be hairy). In the forty-fifth setiger of an apparently mature male, there are about 20 of these setae in each ramus. In the posterior region, neurosetae are narrow and limbate again, similar to figure 7*i*. The tube is apparently ephemeral, being made of soft and fairly transparent mucoid material.

The name refers to the provisional name used by us prior to the description.

DIAGNOSIS.—A *Tharyx* species with beadlike setigers in the middle section of body. Posterior end inflated. Anus dorsal. Very broad neurosetae with distinct hairs on cutting edge in the middle section of body.

DIFFERENTIAL DIAGNOSIS.—Among the *Tharyx* species in Hartman (1959, 1965b) but omitting *T. annulosus* (see p. 31), and adding *Tharyx* sp. described by Berkeley and Berkeley (1941, from California) and *T. serratisetis*, new species, the following have serrated (or apparently so) neurosetae: *T. dorsobranchialis* (Kirkegaard), *T. serratisetis*, new species, *T. tesselata* Hartman, and the mentioned *Tharyx* sp. Among these, *T. tesselata* has an inflated posterior end like *T.*

secundus, but the middle segments are short, whereas there is a beadlike middle section in the new species.

Tharyx serratisetis, new species

FIGURES 7*k*, *l*

Tharyx sp. I Banse et al. [in press].

TYPES.—Holotype: USNM 36266 (possibly the posterior fragment in the vial is of a second individual), from station 3, 47°44′31″ N, 122°31′53″ W (February 1963). Paratypes: USNM 36267 (2) and 36268 (1), from the same station (February and April 1963).

There are numerous fragments, in part of mature animals, from several stations, with up to about 125 setigers, 2 cm long and 2 mm greatest width. The total length is more likely to be 4 cm, and the number of setigers may well reach 200. Most specimens come from station 3, fewer come from stations 6 and 8, some were found at station 7 (in 2 of 35 hauls from the station), where an egg-bearing female occurred.

DESCRIPTION.—The prostomium is conical and can be slightly longer than wide. Eyes are not visible. The achaetous region appears to consist of three indistinct rings. Palps are lost. Gills are rare on the preserved material and not longer than the body is wide; they arise just above the notopod. The anterior setigers are very crowded, and external borders of segments are not well visible. The dorsum is high. Starting from the fifth to tenth setiger, the ventrum is glandular through the sixtieth to seventieth setiger in mature specimens, and to the forty-fifth in one young, complete animal 2 cm long and 0.5 mm at greatest width. In moderately contracted animals, segments become about three times as long as in the anterior region from about the fiftieth to seventy-fifth setiger. From about the one hundred twenty-fifth setiger, segments are about five times as long as the anterior ones. The middle region of the body is not beadlike. The body tapers gradually to the pygidium, which carries a semicircular ventral lip with the result that the anus is dorsal.

Notosetae are long thin capillaries that are one-half to three-fourths as long as the body is wide; neurosetae are one-third to one-half as long as the notosetae of this region. All these setae are slightly limbate and have cutting edges with fine hairs (fig. 7*k*) that are just visible under ×400 magnification. The hairs appear to be outcroppings of the fibers that make up the setae. After the seventy-fifth to one-hundredth setigers, these thin neurosetae are replaced by flattened serrated setae, measuring about 75μ from the beginning of the serrated region to the tip (fig. 7*l*), and by about a dozen that are twice as long owing to a

long drawn-out tip. When the preparation of a parapodium is squeezed under the cover glass, the long and short setae seem to alternate.

Tubes are not known. Exceedingly numerous polygonal eggs, about 150μ by 110μ, are observed in a female in May. The intestinal content of two specimens from station 3 (mean particle size 0.126 mm) contains many sand grains 0.2 mm in diameter and even an unbroken *Coscinodiscus* species test 0.25 mm in diameter, in addition to smaller grains and much fine detritus. Thus, the species may be a not very selective deposit feeder.

The name refers to the serrated neurosetae.

DIAGNOSIS.—A *Tharyx* species with serrated neurosetae after the seventy-fifth to one-hundredth setigers. Median segments not beadlike. Posterior end not inflated. Anus dorsal.

DIFFERENT DIAGNOSIS.—Among the *Tharyx* species in Hartman (1959, 1965b), but omitting *T. annulosus* Hartman (p. 31) and adding *T. secundus*, new species, and *Tharyx* sp. described by Berkeley and Berkeley (1941, from California), only *T. dorsobranchialis* (Kirkegaard), *T. tesselata* Hartman, and the mentioned *Tharyx* sp. are known to have serrated setae. Of these, *T. dorsobranchialis* has a very peculiar arrangement of gills. *Tharyx secundus* has a beadlike middle body region and an inflated posterior end. *Tharyx tesselata* has an inflated posterior end and a characteristic tube. Also, the serrated broad neurosetae start very roughly at the fiftieth setiger (from material kindly sent by Dr. O. Hartman). The Berkeleys' species has four achaetous rings following the prostomium, and the serrated setae seem to start at a low-numbered setiger. Thus, the new form is easily distinguished from the species with serrated setae. The form seems also to be different from all those species that are known to have flattened posterior neurosetae for which serration has not been described. We note, however, that there is a very minute serration on the flattened neurosetae of *T. multifilis* Moore from our samples; in fact, we cannot distinguish anterior fragments of the new species from those of *T. multifilis*.

Family FLABELLIGERIDAE

Brada sachalina Annenkova?

Brada sachalina.—Ushakov, 1955, p. 310.

There are about 10 specimens up to 3 cm long that are profusely covered with sand grains and usually have 23 setigers (22–25). The notosetae (three to five per bundle) are longer and thinner than the neurosetae (five per bundle). The dermal papillae are dome shaped with a short filiform tip; there are two (sometimes three) rows per segment. The nephridial papillae arise on the anterior portion of the

fifth setiger but are barely noticeable. From Annenkova's description (1922), *B. sachalina* is distinguished from *B. ochotensis* Annenkova mainly by the number of segments. Our specimens are intermediate in this respect. Both species have been described from the southern Sea of Okhotsk and occur also in the Bering Sea.

Found only at station 2. Neither species has been found in the eastern Pacific before.

Family Opheliidae

Travisia brevis Moore

Our specimens, about 1.5 cm long, have 25 setigers followed by four achaetous segments, whereas Hartman (1961) stated that there are only two achaetous rings. Imajima (1963) has reported 24 setigers and four achaetous segments for specimens from the Okhotsk Sea, and Imajima (1964) has found 23 setigers in animals collected off Hokkaido.

Family Maldanidae

Isocirrus longiceps (Moore)

Very numerous spherical (or slightly depressed) eggs about 250μ in diameter were observed in November.

Macroclymene? species

Figures 8*a–f*

Macroclymene? sp. I Banse et al. [in press].

Incomplete mature specimens with up to 27 setigers are about 6 cm long and 1 mm thick. The longest animal is without the anterior three setigers and the rear end and must thus have had at least 30 setigers; probably it had at least 34 setigers.

The cephalic plate (figs. 8*a*, *b*) has a low rim that dorsally is almost absent; there is no dorsal incision. The palpode is obtuse. Nuchal grooves are straight and one-half to three-fifths as long as the cephalic plate. The proboscis has conspicuous papillae that are triangular in side view. There are two to three slightly bent acicular spines (fig. 8*c*) in each parapodium of the first three setigers. These setigers are glandularized over their entire length. There are two bundles of 14–18 limbate capillary setae each per ramus in the fifth and sixth setiger, with the fibrilles arranged as in figure 8*d*. The edges of the setae are not quite smooth (not shown in fig. 8*d*). There are six to seven short and long capillary setae each per ramus in the middle part of the body. The shorter ones are beset with hairs (fig. 8*e*) up to the tip; the longer ones seem to carry hairs only in the proximal half. Thoracal unicni (14 per ramus in the fifth setiger) have one or two fewer secondary

teeth than the abdominal ones (fig. 8*f*; 10 per ramus). The pygidium is not known in spite of very many specimens obtained with a grab digging to about 15 cm depth.

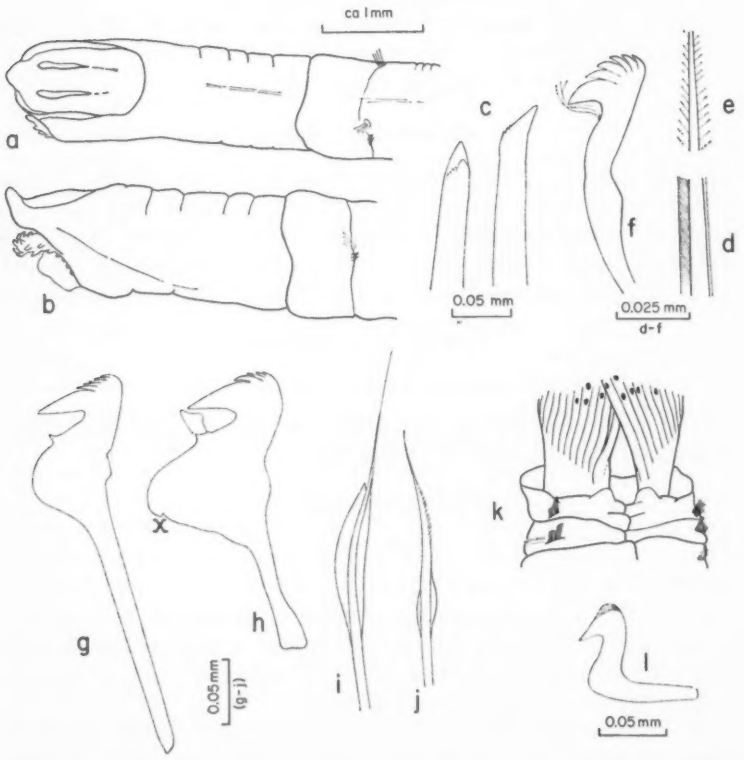

FIGURE 8.—*Macroclymene?* species: *a*, anterior end from above and slightly from the left side; *b*, left side view of anterior end; *c*, acicular spines from second setiger; *d*, detail of capillary seta from fifth setiger; *e*, detail of short capillary seta from middle portion of body; *f*, hook from middle portion of body. *Pista fasciata:* *g*, thoracic hook from third setiger; *h*, thoracic hook from 17th setiger. *Scionella japonica*, setae from median thoracic setiger: *i*, long capillary seta; *j*, short capillary seta. *Potamilla myriops:* *k*, dorsal view of anterior segments; *l*, thoracic hook.

The tube is made of a fairly firm, thin layer of very fine sand. Immature flattened eggs taken in August from an anterior end of 12 setigers of 35 mm length and 1.1 mm width measured up to 250μ across.

This is not one of the species known from this area and may well represent the genus *Macroclymene*, not yet recorded for the northern Pacific. Found at station 2. The drawings are of a mature specimen taken in August 1963.

Praxillella affinis pacifica Berkeley

Having many specimens, we add the following to the descriptions by Berkeley (1929) and Berkeley and Berkeley (1952): The dorsal rim of the cephalic plate can be split or more or less united. The proboscideal papillae are pointed as in *P. gracilis* (Sars) rather than smooth as in our specimens of *P. affinis* (Sars). The fourth setiger is the first fully glandular one as in *P. gracilis*, rather than the third setiger as in *P. affinis*. Feathered setae occur also in the posterior bundle of the twelfth setiger, rather than in the tenth or tenth and eleventh only. The constriction preceding the pygidium, emphasized by Berkeley (1929) for the subspecies, is much more marked in our material of *P. gracilis* than in the form discussed here.

Numerous eggs of 240μ-280μ diameter are observed in animals collected in November. Young specimens occur together with adults in February.

Rhodine bitorquata Moore

Posterior ends of this species have apparently not been described yet. From one specimen we find that double rows of uncini occur through the fifteenth setiger and the first posterior collar occurs on the seventeenth setiger, as in *R. loveni* Malmgren. Arwidsson (1907) has stressed that these characters seem to be completely constant within species.

The papillae of the proboscis of our specimen seem to have about the same form as in *R. loveni*, but details could not be made out. The margin of the posterior collar of many fragments is practically smooth with a slight dorsal notch; the hooks of our specimens also agree with the figure given by Arwidsson (1907, fig. 235 for *R. loveni*) so that the only gross difference of *R. bitorquata* from *R. loveni* continues to be the sharply bent nuchal groove of the former, as emphasized by Berkeley and Berkeley (1950).

Individuals with moderately numerous, lens-shaped eggs of up to 140μ largest diameter are observed in January. Young animals are found in February.

Two individuals from station 4 (mean grain size 0.104 mm) have very coarse sediment (many particles of 0.15–0.20, up to 0.25 mm) and two specimens from station 7 (mean grain size 0.009 mm) have fine material (few grains reaching 0.05 mm) in their intestines. On the sediment studied, the species thus seems to be a nonselective deposit feeder.

Family PECTINARIIDAE

Pectinaria (*Cistenides*) *granulata* (Linné)

Pectinaria granulata.—Pettibone, 1954, p. 312.
Pectinaria brevicoma.—Berkeley and Berkeley, 1952, p. 106.

We follow Pettibone (1954) and include *P. brevicoma* Johnson described from Puget Sound in *P. granulata* because of the variability of some characters used for separation of the species. In our animals there are 10–11 pairs of brassy cephalic spines, about 20–40 papillae on the antennal membrane, and 5–7 scaphal hooks. The uncini have three to four major teeth.

In small specimens, there can occur on one torus uncini with one row of major teeth, as typical for the subgenus *Cistenides*, and uncini with a double row, as in the subgenus *Pectinaria*. The large specimens all have a single series of major teeth in their uncini. Moore (1923) has stated that "this species unites *Pectinaria* and *Cistenides*."

Family AMPHARETIDAE

Ampharete acutifrons (Grube)

The tentacles of our specimens are smooth contrary to the generic diagnosis by Malmgren (1866) and Day (1964). Mature females are about 15 mm long and 1 mm thick but there are two broken specimens, otherwise very well preserved, that are at least 20 mm long and 2.5 mm thick, and apparently are not mature. Pettibone (1954) has stated a length of 55 mm and a width of 8 mm as the greatest size for the species. The species is a selective deposit feeder, as seen from the comparison of intestinal content with the sediment of the habitat.

There are animals from all seasons. Many specimens collected in August and one found in May carry fairly numerous oval-lens-shaped eggs, up to 240μ x 200μ x 50μ in size.

Ampharete gagarae Ushakov

Ampharete arctica gagarae.—Ushakov, 1955, p. 369.

In this form, which we consider to be a species of its own, the neuropodial lappets of the middle region of the abdomen are about one-fourth as long as the segments, whereas they are nearly as long as the segments in one specimen of *A. arctica* from Puget Sound. No anal cirri were found even in well-preserved animals. The species is a selective deposit feeder.

Very few (50–100) irregular oval-lens-shaped eggs of about 220μ x 190μ x 50μ–70μ dimensions are observed in one specimen collected in January.

Found at stations 1–4 and 6–8. New for the northeast Pacific. Previously known from the Sea of Okhotsk.

Melinna elisabethae McIntosh

Melinna elisabethae.—Ushakov, 1955, p. 363.

There are four moderately well-preserved specimens. The gills form groups of one anterior and three posterior filaments. The thoracal setigers are arranged as in *M. cristata* (Sars) although the fourth bundle of the fine ventral capillary setae is visible only in transparent animals. The strong dorsal hooks have relatively short and broad bases, and the tips are bent backward by almost 180°, more so than pictured by Ushakov (1955, fig. 134D). There is no canal in the tip. The uncini have four teeth. The species is a selective deposit feeder. Found at stations 1, 3, and 4. New for the northeastern Pacific. Previously known from the Sea of Okhotsk and the Arctic.

Family Terebellidae

Neoamphitrite edwardsi (Quatrefages), new combination

Amphitrite edwardsii.—Fauvel, 1923, p. 245.—Hartman, 1961, p. 497.—Imajima and Hartman, 1964, p. 335.

There are three large specimens up to 13.5 cm long. Eyes appear to be absent. Seventeen setigers have notosetae; double rows of uncini occur from the eighth to the seventeenth setiger. Lateral folds are large on the two first segments bearing gills and are practically absent on the third one. Nephridial papillae are present on 9 consecutive segments, not on 12 as in *N. robusta* (Johnson), starting on the second segment with gills. There are 11 or 12 ventral shields.

We place the species into the genus *Neoamphitrite* because of the arborescent gills, but we have not studied the nephridia. Hessle (1917) has tentatively suggested this action.

Found at station 2 and near station 7. New for Puget Sound. Previously known in the North Pacific from Japan.

Pista fasciata (Grube) sensu Marenzeller

Figures 8*g*, *h*

Pista fasciata.—Imajima and Hartman, 1964, p. 343.

Since there is some confusion about this species in the literature, the following may be observed: Our specimens, which are more than 10 cm long, agree well with the accounts of Marenzeller (1884) and Imajima and Hartman (1964). The lateral folds are shaped as described by the latter authors. Dorsally, the fourth segment (first setiger) is very much higher than the preceding ones. Nephridial

pores are present on setigers 3 and 4 (segments 6 and 7), contrary to Indian material (Fauvel, 1932). Nearly rectangular ventral shields occur through the thirteenth setiger. From the first setiger onward a wide glandular band is present ventrally and laterally behind the tori (without a torus being on the first, it is in the corresponding place). In the anterior part of the thorax it is laterally as broad as the tori but is hardly visible ventrally between the ventral shields. In the middle region of the thorax, glands occupy laterally all the space between the tori and the posterior border of the segments. Between the tori and the shields, they occupy one-half to over three-fourths of the length of the setigers. Ventrally, on the last four thoracic setigers, only the anterior one-third to one-half of the segments is free of glands

All thoracic uncini have narrow, long, thin shafts (figs. 8*g*, *h*). In side view, the number of teeth above the rostrum appears to be five to six in anterior segments, and four to five in posterior segments of the thorax. The protuberance ("x" in fig. 8*h*) on the lower anterior curvature of the posterior thoracic hooks is often less pronounced than shown.

Proclea graffi (Langerhans)

Proclea graffi.—Ushakov, 1955, p. 395.

There are three fairly well-preserved specimens from three hauls at station 3 in February.

New for Puget Sound. Previously known in the North Pacific from the Bering Sea.

Scionella japonica Moore

FIGURES 8*i*, *j*

The gills of our two specimens from station 7 agree with the description by Moore (1903) and are like those of *S. vinogradovi* (Ushakov, 1955, figs. 143D, E), but not like those of *S. japonica* Berkeley and Berkeley (1952, fig. 176). Since the differences between these two species do not seem to be very clear, we give figures for the thoracal setae (figs. 8*i*, *j*). Strong, long setae with very broad blades alternate with slightly more slender, shorter capillary bristles whose shafts are serrated above the short and narrow wings. Berkeley and Berkeley (1950) have pointed out that Moore figured only the larger setae.

Family SABELLIDAE

Potamilla (*Pseudopotamilla*) *myriops* (Marenzeller)

FIGURES 8*k*, *l*

Pseudopotamilla myriops.—Imajima and Hartman, 1964, p. 360.

One anterior end of about 8 cm total length (about 2 cm for the tentacular crown) and 6 mm greatest width with nine thoracic and 30 abdominal setigers comes from station 7. Several other pieces in the sample appear to be from the same specimen, adding to about 21 cm total length and 195 setigers. The pygidium is missing.

The species is particularly distinguished by the eyespots on the slightly more than 30 pairs of radioli. Ventrally there are about 10, dorsally up to 20, eyes per radiolus, the most distal ones leaving the last third of the rachis free. The basis of the most dorsal radiolus on each lophophore is widened on its dorsal side to give a sharp, straight edge. Ventrally, the lophophores are slightly rolled inwardly The collar (fig. 8*k*) is reduced dorsally; ventrally it is drawn out into two fairly long lips separated by a cleft.

In a median thoracal setiger, there are 20 limbate capillary setae, about 55 spatulate bristles with fine tips, and almost 70 hooks and as many pickaxe-shaped setae. A hook is depicted (fig. 8*l*) to show the length of the manubrium. The number and length of the hooks is about the same in the last thoracic setiger. The abdominal setae are as figured by Marenzeller (1884, pl 3: fig. 2E).

The color of the trunk of the animal is red brown; the parapodia are only slightly lighter. The ventral shields are cream white. There are no colored bands in the tentacular crown in the preserved material.

Augener (1914) has included this species with hesitation among the synonyms of *P. oligophthalmos* Grube, and Ushakov (1955) has followed him. Our specimens seems to be different from *P. ehlersi* (Gravier), another synonym of *P. oligophthalmos*, because of the different size of the ventral lobe of the collar alone. The two records by Zachs (1933) and Annenkova (1938) of *P. oligophthalmos* included by Ushakov (1955) are certainly not concerned with *P. myriops*.

Found at station 7. Also collected in March and September 1966 at 47°12′00″ N, 122°44′45″ W at 18 m and about 10 m depth. New for the northeastern Pacific. Previously known from Japan.

Summary

Eight species are newly described: *Eunoe uniseriata*, *Eulalia* (*Pterocirrus*) *parvoseta*, *Laonice pugettensis*, *Paraspio cirrifera*, *Chaetozone acuta*, *C. berkeleyorum*, *Tharyx secundus* and *T. serratisetis*. Information on type material is provided for *Eulalia* (*Eulalia*) *levicornuta*, *Gyptis brevipalpa*, *Exogone lourei*, *Syllis* (*Typosyllis*) *harti*, *Dorvillea pseudorubrovittata*, *Laonice antarcticae*, *L. japonica*, and *Chaetozone gracilis*. *Caulleriella annulosa* and *Neoamphitrite edwardsi* are new combinations. New characters are described for *Micropodarke dubia*, *Pionosyllis uraga*, *Aricidea* (*Aricidea*) *ramosa*,

Paraonis (*Paraonis*) *ivanovi*, *Prazillella affinis pacifica*, *Rhodine bitorquata*, *Scionella japonica* and *Potamilla* (*Pseudopotamilla*) *myriops*. Twenty-four new records for Washington and British Columbia waters are given. Intestinal contents of local species of *Glycera* and *Lumbrineris* suggest deposit feeding but it is not certain that it is the exclusive mode of nutrition.

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